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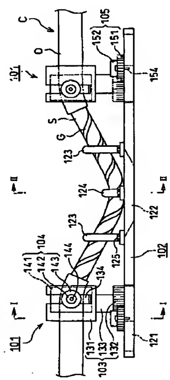
(54)【発明の名称】　光ケーブル分岐具及び光ケーブル分岐方法

(57)【要約】
【課題】　光ケーブル内に収納された光ファイバ心線を光ファイバには損傷を与えずに取り出して、光ファイバを容易に分岐させることのできる光ケーブル分岐具を提供すること。
【解決手段】　分岐させる光ケーブルＣの分岐部分の両端を把持する一対のケーブル把持部１０１と、一対のケーブル把持部１０１が取り付けられる土台部１０２とを備えた光ケーブル分岐具において、少なくとも一方のケーブル把持部１０１が、土台部１０２にスライド自在に取り付けられており、土台部１０２に対してケーブル把持部１０１を光ケーブルＣの延設方向にスライドさせることにより、分岐部分を撓ませることを特徴とする。



【特許請求の範囲】
【請求項１】　分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対の前記ケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、
少なくとも一方の前記ケーブル把持部が、前記土台部にスライド自在に取り付けられており、
前記土台部に対して前記ケーブル把持部を前記光ケーブルの延設方向にスライドさせることにより、前記分岐部分を撓ませることを特徴とする光ケーブル分岐具。
【請求項２】　分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対の前記ケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、
少なくとも一方の前記ケーブル把持部が、前記土台部に取り付けられる取付部材と、前記取付部材にスライド自在に取り付けられて前記光ケーブルを把持する把持部材とを有しており、
前記取付部材に対して前記把持部材を前記光ケーブルの延設方向にスライドさせることにより、前記分岐部分を撓ませることを特徴とする光ケーブル分岐具。
【請求項３】　分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対の前記ケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、
前記土台部が、一方の前記ケーブル把持部が取り付けられた第一土台部と、他方の前記ケーブル把持部が取り付けられ且つ前記第一土台部にスライド自在に取り付けられた第二土台部とを有しており、
前記第一土台部又は前記第二土台部を前記光ケーブルの延設方向にスライドさせることにより、前記分岐部分を撓ませることを特徴とする光ケーブル分岐具。
【請求項４】　分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対の前記ケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、
前記土台部が、一方の前記ケーブル把持部が取り付けられた第一土台部と、他方の前記ケーブル把持部が取り付けられた第二土台部と、前記第一土台部及び前記第二土台部がそれぞれスライド自在に取り付けられた連結部とを有しており、
前記連結部に対して前記第一土台部又は前記第二土台部を前記光ケーブルの延設方向にスライドさせることにより、前記分岐部分を撓ませることを特徴とする光ケーブル分岐具。
【請求項５】　前記土台部が、撓ませた前記光ケーブルの形状を保持する押さえ部材を有している、請求項１～４の何れかに記載の光ケーブル分岐具。
【請求項６】　前記土台部が、撓ませた前記光ケーブルの分岐部分を挿入させるスリットを有している、請求項１～５の何れかに記載の光ケーブル分岐具。
【請求項７】　分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対の前記ケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、
少なくとも一方の前記ケーブル把持部が、前記土台部に取り付けられる取付部材と、前記取付部材に回転自在に取り付けられて前記光ケーブルを把持する把持部材とを有しており、
前記取付部材に対して前記把持部材を前記光ケーブルの断面中心を中心として回転させることにより、前記分岐部分に捻りを与えることを特徴とする光ケーブル分岐具。
【請求項８】　請求項１～４の何れかに記載の光ケーブル分岐具を用いて、分岐される光ケーブルの分岐部分の両端を前記光ケーブル分岐具の一対のケーブル把持部により把持し、
一対の前記光ケーブル把持部により把持された前記分岐部分の両端を近づけて前記分岐部分を撓ませ、
前記分岐部分から光ファイバ心線を取り出して分岐させ、
前記光ファイバの取り出し後に一対の前記ケーブル把持部を遠ざけて前記分岐部分の撓みを解消させることを特徴とする光ケーブル分岐方法。
【請求項９】　請求項７に記載の光ケーブル分岐具を用いて、分岐される光ケーブルの分岐部分の両端を前記光ケーブル分岐具の一対のケーブル把持部により把持し、
一対の前記光ケーブル把持部の把持部材を回転させて前記分岐部分に捻りを与え、
前記分岐部分から光ファイバ心線を取り出して分岐させ、
前記光ファイバの取り出し後に前記可動部を元の位置に回転させて前記分岐部分の捻りを解消させることを特徴とする光ケーブル分岐方法。
【請求項１０】　分岐される光ケーブルの分岐部分の両端を前記光ケーブル分岐具の一対のケーブル把持部により把持し、
一対の前記光ケーブル把持部により把持された前記分岐部分の両端を近づけて前記分岐部分を撓ませ、
前記分岐部分から光ファイバ心線を取り出して分岐させ、
前記光ファイバの取り出し後に一対の前記ケーブル把持部により前記分岐部分の撓みを維持させておくことを特徴とする光ケーブル分岐方法。
【請求項１１】　分岐される光ケーブルの分岐部分の両端を固定し、
前記分岐部分の両端を近づけて前記分岐部分を撓ませると共に、前記分岐部分の両端のうち少なくとも一端を回転させて前記分岐部分に捻りを与え、
前記分岐部分から光ファイバ心線を取り出して分岐さ

せ、
前記光ファイバの取り出し後に前記分岐部分の捻りのみを解消し、前記分岐部分の撓みを維持させておくことを特徴とする光ケーブル分岐方法。

【発明の詳細な説明】

【0001】
【発明の属する技術分野】本発明は、光ケーブルの内部に収納された光ファイバを取り出して分岐させる光ケーブルの分岐具、及び光ケーブルの内部に収納された光ファイバを分岐させる光ケーブルの分岐方法に関するものである。

【0002】
【従来の技術】光ケーブルの敷設後に光ファイバの接続切替や分岐が必要となることが敷設前から予想されている場合は、接続切替や分岐が必要な部位に接続箱を配置し、この接続箱の中に余長を持たせた光ファイバを収納させておくのが一般的である。敷設後の接続切替や分岐作業時には、接続箱から光ファイバの余長部分を取り出して作業する。しかし、敷設後に、予め接続切替や分岐させることを予想していない部位で分岐を行わなくてはならない場合（いわゆる中間後分岐の場合）がある。中間後分岐時に用いられる光ケーブル分岐具や光ケーブル分岐方法としては、特開平7-107570号公報、実開平2-19102号公報又は特開平1-310306号公報に記載されたものなどが知られている。

【0003】
【発明が解決しようとする課題】中間後分岐作業時においては、心線判別機により光ファイバ心線を挟んで分岐させるべき光ファイバがどれかを判別したり、ニッパーなどで光ファイバ心線を挟み込んで切断する。しかし、上述した公報に記載されている分岐具や分岐方法においては、光ファイバ心線を取り出し難く、分岐すべき光ファイバの判別や切断を行いにくいという欠点があった。即ち、上述した公報に記載されている分岐具では、直線的に配置された光ケーブルの内部から光ファイバ心線を取り出そうとしても、光ケーブル本体から光ファイバ心線を十分に浮かせることができず、光ファイバ心線を挟み込む際に光ファイバに損傷を与えてしまう危険があった。

【0004】従って、本発明は、光ケーブル内に収納された光ファイバ心線を光ファイバには損傷を与えずに取り出して、光ファイバを容易に分岐させることのできる光ケーブル分岐具及び光ケーブル分岐方法を提供することを目的としている。

【0005】
【課題を解決するための手段】請求項１に記載の発明は、分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対のケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、少なくとも一方のケーブル把持部が、土台部にスライド自在に取り付けられており、土台部に対してケーブル把持部を光ケーブルの延設方向にスライドさせせることにより、分岐部分を撓ませることを特徴としている。

【０００６】請求項２に記載の発明は、分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対のケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、少なくとも一方のケーブル把持部が、土台部に取り付けられる取付部材と、取付部材にスライド自在に取り付けられて光ケーブルを把持する把持部材とを有しており、取付部材に対して把持部材を光ケーブルの延設方向にスライドさせることにより、分岐部分を撓ませることを特徴としている。

【０００７】請求項３に記載の発明は、分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対のケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、土台部が、一方のケーブル把持部が取り付けられた第一土台部と、他方のケーブル把持部が取り付けられ且つ第一土台部にスライド自在に取り付けられた第二土台部とを有しており、第一土台部又は第二土台部を光ケーブルの延設方向にスライドさせることにより、分岐部分を撓ませることを特徴としている。

【０００８】請求項４に記載の発明は、分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対のケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、土台部が、一方のケーブル把持部が取り付けられた第一土台部と、他方のケーブル把持部が取り付けられた第二土台部と、第一土台部及び第二土台部がそれぞれスライド自在に取り付けられた連結部とを有しており、連結部に対して第一土台部又は第二土台部を光ケーブルの延設方向にスライドさせることにより、分岐部分を撓ませることを特徴としている。

【０００９】請求項５に記載の発明は、請求項１～４の何れかに記載の発明において、土台部が、撓ませた光ケーブルの形状を保持する押さえ部材を有していることを特徴としている。

【００１０】請求項６に記載の発明は、請求項１～４の何れかに記載の発明において、土台部が、撓ませた光ケーブルの分岐部分を挿入させるスリットを有していることを特徴としている。

【００１１】請求項７に記載の発明は、分岐させる光ケーブルの分岐部分の両端を把持する一対のケーブル把持部と、一対のケーブル把持部が取り付けられる土台部とを備えた光ケーブル分岐具において、少なくとも一方のケーブル把持部が、土台部に取り付けられる取付部材と、取付部材に回転自在に取り付けられて光ケーブルを把持する把持部材とを有しており、取付部材に対して把持部材を光ケーブルの断面中心を中心として回転させることにより、分岐部分に捻りを与えることを特徴として

いる。
【００１２】請求項８に記載の発明は、請求項１～４の何れかに記載の光ケーブル分岐具を用いて、分岐される光ケーブルの分岐部分の両端を光ケーブル分岐具の一対のケーブル把持部により把持し、一対の光ケーブル把持部により把持された分岐部分の両端を近づけて分岐部分を撓ませ、分岐部分から光ファイバ心線を取り出して分岐させ、光ファイバの取り出し後に一対のケーブル把持部を遠ざけて分岐部分の撓みを解消させることを特徴としている。
【００１３】請求項９に記載の発明は、請求項７に記載の光ケーブル分岐具を用いて、分岐される光ケーブルの分岐部分の両端を光ケーブル分岐具の一対のケーブル把持部により把持し、一対の光ケーブル把持部の把持部材を回転させて分岐部分に捻りを与え、分岐部分から光ファイバ心線を取り出して分岐させ、光ファイバの取り出し後に可動部を元の位置に回転させて分岐部分の捻りを解消させることを特徴としている。
【００１４】請求項１０に記載の発明は、分岐される光ケーブルの分岐部分の両端を光ケーブル分岐具の一対のケーブル把持部により把持し、一対の光ケーブル把持部により把持された分岐部分の両端を近づけて分岐部分を撓ませ、分岐部分から光ファイバ心線を取り出して分岐させ、光ファイバの取り出し後に一対のケーブル把持部により分岐部分の撓みを維持させておくことを特徴としている。
【００１５】請求項１１に記載の発明は、分岐される光ケーブルの分岐部分の両端を固定し、分岐部分の両端を近づけて分岐部分を撓ませると共に、分岐部分の両端のうち少なくとも一端を回転させて分岐部分に捻りを与え、分岐部分から光ファイバ心線を取り出して分岐させ、光ファイバの取り出し後に分岐部分の捻りのみを解消し、分岐部分の撓みを維持させておくことを特徴としている。
【００１６】
【発明の実施の形態】本発明の光ケーブル分岐具の実施形態について、図面を参照しつつ説明する。
【００１７】まず、請求項１及び請求項５～請求項７に記載の発明の実施形態にあたる光ケーブル分岐具について図１～図３を参照しつつ説明する。
【００１８】図１に示される光ケーブル分岐具においては、一対のケーブル把持部１０１が、互いに対向された状態で土台部１０２の両端にそれぞれ取り付けられており、土台部１０２に対してそれぞれスライド可能とされている。
【００１９】以下には、一対のケーブル把持部１０１のうちの一方について説明するが、他方のケーブル把持部１０１も一方のケーブル把持部１０１と鏡像の関係にある同様の構造を有している。ケーブル把持部１０１は、土台部１０２に取り付けられる取付部材１０３と、この取付部材１０３に回転自在に取り付けられて光ケーブルＣを把持する把持部材１０４とからなる。
【００２０】取付部材１０３は、把持部材１０４を保持する保持部１３１、土台部１０２にスライド自在に取り付けられるスライド部１３２、及び保持部１３１とスライド部１３２とを連結する柱状部１３３からなる。
【００２１】保持部１３１は、図１及び図２(a)に示されるように、上方が開放されたＵ字形断面を有しており、その両側面には上端から下方に向けてガイドスリット１３４がそれぞれ形成されている。保持部１３１の最下端が柱状部１３３と結合されており、保持部１３１は柱状部１３３を介してスライド部１３２と連結されている。
【００２２】スライド部１３２は、図２(a)及び図３に示されているように、ほぼ直方体状の形態を有しており、土台部１０２上面より上方に露出されている部分の一側面にギア歯が形成されている。スライド部１３２は、その下方が土台部１０２のガイド孔１２１内に挿入されており、その最下端が横に広げられてガイド孔１２１から外れないようにされている。ガイド孔１２１の長さはスライド部１３２の長さよりも長く形成されており、スライド部１３２はガイド孔１２１内で光ケーブルＣの延設方向にスライドする。
【００２３】スライド部１３２側面のギア部には、回転ギア部１０５が噛み合わされている。回転ギア部１０５は、土台部１０２に対して回転自在に取り付けられている。回転ギア部１０５は、外周にギア歯が形成された円盤部１５１と、円盤部１５１の上面中央に突出されたツマミ部１５２とからなる。ツマミ部１５２の直径は円盤部１５１よりも小さく、ツマミ部１５２を回転させることにより、円盤部１５１及びスライド部１３２のギア歯を介して、ケーブル把持部１０１を光ケーブルＣの延設方向にスライドさせることができる。
【００２４】円盤部１５１の上面から下面にかけて、固定ピン１５４を貫通挿入させる複数のピン貫通孔１５３が均等に穿孔されており、このピン貫通孔１５３に対応させて、円盤部１５１下方の土台部１０２にもピン挿入孔１２６が一つ穿孔されている。ピン挿入孔１２６と何れかのピン貫通孔１５３との位置をわせて固定ピン１５４を挿入することにより、回転ギア部１０５の回転を抑止してケーブル把持部１０１のスライドを抑止する。
【００２５】上述した保持部１３１により保持される把持部材１０４は、図１及び図２(a)に示されるように、保持部１３１の内面に接触して配される筒状部１４１、筒状部１４１に対して対向して螺合される一対のボルト部１４２、及びボルト部１４２に螺合される固定ナット１４３からなる。
【００２６】筒状部１４１は、保持部１３１下方内面のカーブに合わせた円形断面を有しているが、その一部が光ケーブルＣを内部に配置させるために切り欠かれてい

る。筒状部１４１には、対向する一対のボルト部１４２が螺合されており、筒状部１４１の内部側に位置するボルト部１４２の端部には、内面に細かい凹凸が形成された湾曲板１４５が取り付けられている。湾曲板１４５は、ボルト部１４２に対して回転可能である。この一対の湾曲板１４５により光ケーブルＣの分岐部分両端を把持する。

【００２７】筒状部１４１の外部側に位置するボルト部１４２の端部には、固定ナット１４３が螺合されている。また、筒状部１４１の外部側に位置するボルト部１４２の端面には、図１に示されるように、六角の棒スパナを嵌合させる凹部１４４が形成されている。把持部材１０４は、上方より保持部１３１上に載置され、ボルト部１４２がガイドスリット１３４にガイドされて、その中心を回転軸として保持部１３１上で回転する。このとき、保持部１３１は、筒状部１４１と固定ナット１４３との間に位置する。

【００２８】土台部１０２は、板状の部材で、その両端に上述したケーブル把持部１０１が取り付けられる。土台部１０２の両端には、上述したようにガイド孔１２１がそれぞれ形成され、回転ギア部１０５がそれぞれ取り付けられている。そして、土台部１０２の中央には、図１及び図２(b)に示されるように、スリット１２２が形成されている。スリット１２２は、光ケーブルＣのスペーサＳの外径よりもやや広い幅を有しており、その両端は内方に向けて傾斜面とされている。

【００２９】スリット１２２の両端には、このスリット１２２を跨ぐように押さえ部材１２３がそれぞれ取り付けられており、スリット１２２の中央には、このスリット１２２を跨ぐように押さえ部材１２４が取り付けられている。押さえ部材１２３と押さえ部材１２４との違いは、その高さだけである。押さえ部材１２３，１２４は、高さは異なるが共に逆Ｕ字形をしており、その両端の間の距離がスリット１２２の幅にほぼ等しくされている。押さえ部材１２３，１２４は、その一端が蝶番を介してスリット１２２の側方に固定されて開閉可能にされており、その他端は、ボルト１２５を用いて反対側のスリット１２２側方に固定できるようにされている。

【００３０】次に、請求項２及び請求項５～請求項７に記載の発明の実施形態にあたる光ケーブル分岐具について図４及び図５を参照しつつ説明する。

【００３１】図４及び図５に示される光ケーブル分岐具は、上述した図１～図３に示される光ケーブル分岐具とは光ケーブルＣの分岐部分両端を光ケーブルＣの延設方向に移動させる機構のみが異なり、その他の構成は上述した図１～図３に示される光ケーブル分岐具と同様に構成されている。このため、以下には、図１～図３に示される光ケーブル分岐具と同一又は同等の構成部位については、同一の符号を付してその詳しい説明を省略し、異なる構成部位について特に詳しく説明する。

【００３２】図４に示される光ケーブル分岐具においては、一対のケーブル把持部２０１が、互いに対向された状態で土台部２０２の両端にそれぞれ固定されている。

【００３３】以下には、一対のケーブル把持部２０１のうちの一方について説明するが、他方のケーブル把持部２０１も一方のケーブル把持部２０１と全く同様の構造を有している。ケーブル把持部２０１は、土台部２０２に取り付けられる取付部材２０３と、この取付部材２０３にスライド・回転自在に取り付けられて光ケーブルＣを把持する把持部材１０４とからなる。把持部材１０４は、上述した図１～図３に示される光ケーブル分岐具における把持部材１０４と全く同様の構造を有しているが、取付部材２０３の構造が異なるため、取付部材２０３上において、回転だけでなくスライドもする。

【００３４】取付部材２０３は、把持部材１０４を保持する保持部２３１と、上端が保持部２３１に結合されると共に下端が土台部２０２に固定される柱状部２３３とからなる。

【００３５】保持部２３１は、図４及び図５に示されるように、上方が開放されたＵ字形断面を有しており、その両側面にはＨ字形のガイドスリット２３４がそれぞれ形成されている。ガイドスリット２３４は、土台部１０２の端部側に位置する垂直方向（光ケーブルＣの延設方向に対して直角な方向）のスリットが、保持部２３１の上端にまで達している。保持部２３１の中央最下端が柱状部２３３に結合されており、保持部２３１は柱状部２３３を介して土台部２０２に固定されている。

【００３６】把持部材１０４は、上方より保持部２３１上に載置され、ボルト部１４２がガイドスリット２３４の水平方向（光ケーブルＣの延設方向に対して平行な方向）のスリットによりガイドされて保持部２３１上で光ケーブルＣの延設方向にスライドする。固定ナット１４３を締め付ければ、保持部２３１に対する把持部材１０４のスライドを固定することができる。また、把持部材１０４は、ボルト部１４２がガイドスリット２３４の垂直方向のスリットにガイドされて、その中心を回転軸として保持部２３１上で回転する。

【００３７】土台部２０２は、長方形状の板状部材で、その両端に上述したケーブル把持部２０１が固定されている。土台部２０２の中央部に、スリット１２２や押さえ部材１２３，１２４が形成・配置されているのは、上述した図１～図３に示される光ケーブル分岐具と同様である。

【００３８】次に、請求項３及び請求項５～請求項７に記載の発明の実施形態にあたる光ケーブル分岐具について図６及び図７を参照しつつ説明する。

【００３９】図６及び図７に示される光ケーブル分岐具は、上述した図１～図３に示される光ケーブル分岐具や図４及び図５に示される光ケーブル分岐具とは光ケーブルＣの分岐部分両端を光ケーブルＣの延設方向に移動さ

せる機構のみが異なり、その他の構成は上述した図１～図５に示される光ケーブル分岐具と同様に構成されている。このため、以下には、図１～図５に示される光ケーブル分岐具と同一又は同等の構成部位については、同一の符号を付してその詳しい説明を省略し、異なる構成部位について特に詳しく説明する。

【００４０】図６に示される光ケーブル分岐具においては、一対のケーブル把持部３０１が、互いに対向された状態で土台部３０２Ａの両端にそれぞれ固定されている。

【００４１】以下には、一対のケーブル把持部３０１のうちの一方について説明するが、他方のケーブル把持部３０１も一方のケーブル把持部３０１と全く同様の構造を有している。ケーブル把持部３０１は、土台部３０２Ａに取り付けられる取付部材３０３と、この取付部材３０３にスライド・回転自在に取り付けられて光ケーブルＣを把持する把持部材１０４とからなる。把持部材１０４は、上述した図１～図５に示される光ケーブル分岐具における把持部材１０４と全く同様の構造を有している。

【００４２】取付部材３０３は、図１～図３に示される光ケーブル分岐具における保持部１３１と図４及び図５に示される光ケーブル分岐具における柱状部２３３とを結合させたものである。

【００４３】土台部３０２Ａは、図６に示されるように、一方のケーブル把持部３０１が取り付けられた第一土台部３０２ａと、他方のケーブル把持部３０１が取り付けられた第二土台部３０２ｂとからなる。第一土台部３０２ａと第二土台部３０２ｂとは互いにスライド自在に連結されており、スリット１２２及び押さえ部材１２３，１２４は第二土台部３０２ｂ上に形成・配置されている。

【００４４】第一土台部３０２ａと第二土台部３０２ｂとの連結部に関して図７を参照して説明する。第一土台部３０２ａの端面中央から柱状部２３３に向けて凸状断面を有するガイド孔３２３が形成されている。ガイド孔３２３の上端は、第一土台部３０２ａの上面にスリット状に開口されている。また、第一土台部３０２ａの面からは一対のガイドピン３２５が突出形成されている。ガイド孔３２３の開口端は、一対のガイドピン３２５の基端部の中央に位置している。

【００４５】これに対して、第二土台部３０２ｂの端面中央からは、ガイド孔３２３の断面形状にほぼ等しい断面形状を有する突出部３２４が突出形成されている。突出部３２４の先端側上面には、ネジ３２７が上方に向けて突設されており、このネジ３２７には、押さえ板３２９がはめられ、更にその上から回転ツマミ３２８が螺合されている。また、第二土台部３０２ｂの端部には、ガイドピン３２５に対応した一対のピン孔３２６が穿孔されている。突出部３２４の基端部は、一対のピン孔３２６の開口端の中央に位置している。

【００４６】回転ツマミ３２８を緩めれば、第一土台部３０２ａに対して第二土台部３０２ｂ（あるいは、第二土台部３０２ｂに対して第一土台部３０２ａ）をスライドさせることができ、ケーブル把持部３０１を光ケーブルＣの延設方向にスライドさせることができる。回転ツマミ３２８を締め付ければ、第一土台部３０２ａに対する第二土台部３０２ｂのスライドを固定することができる。

【００４７】次に、請求項４及び請求項５～請求項７に記載の発明の実施形態にあたる光ケーブル分岐具について図８を参照しつつ説明する。

【００４８】図８に示される光ケーブル分岐具は、上述した図６及び図７に示される光ケーブル分岐具とは土台部３０２Ｂの構造のみが異なり、その他の構成は上述した図６及び図７に示される光ケーブル分岐具と全く同様に構成されている。このため、以下には、図６及び図７に示される光ケーブル分岐具と同一又は同等の構成部位については、同一の符号を付してその詳しい説明を省略し、構造の異なる土台部３０２Ｂについて特に詳しく説明する。

【００４９】土台部３０２Ｂは、図８に示されるように、一方のケーブル把持部３０１が取り付けられた第一土台部３０２ａ、他方のケーブル把持部３０１が取り付けられた第二土台部３０２ａ’及び第一土台部３０２ａと第二土台部３０２ａ’とを連結する連結部３０２ｃからなる。第一土台部３０２ａ及び第二土台部３０２ａ’はそれぞれ連結部３０２ｃに対してスライド自在に連結されており、スリット１２２及び押さえ部材１２３，１２４は連結部３０２ｃ上に形成・配置されている。

【００５０】第一土台部３０２ａと連結部３０２ｃとの連結機構及び第二土台部３０２ａ’と連結部３０２ｃとの連結機構には、それぞれ図７に示されるスライド連結機構が採用されている。

【００５１】次に、上述した図１～図８に示される光ケーブル分岐具を用いた請求項８～請求項１１に記載の光ケーブル分岐方法について説明する。

【００５２】まず、筒状部１４１の内部に予め分岐部分の外被Ｏが除去されてスペーサＳを露出させた光ケーブルＣを導入し、一対のボルト部１４２端部の凹部１４４に六角の棒スパナを嵌合させ、ボルト部１４２を回転させて筒状部１４１の内部側に進入させる。光ケーブルＣの分岐部分の両端は、その外被Ｏ上から湾曲板１４５により挟み込まれて筒状部１４１の中心にそれぞれ固定される。このとき、一対の筒状部１４１は、互いに最も遠ざけられた位置にあり、光ケーブルＣの分岐部分は伸張された状態である。

【００５３】なお、筒状部１４１に対して光ケーブルＣを固定する際には、上述したように、はじめから保持部１３１（２３１）に取り付けられた把持部材１０４に対

して光ケーブルＣを固定しても良いし、把持部材１０４を分岐具から分離させ、把持部材１０４を光ケーブルＣの分岐部分の両端に固定した後に、把持部材１０４を保持部１３１（２３１）に取り付けても良い。また、光ケーブルＣの分岐部分の外被Ｏの除去は、光ケーブルＣを把持部材１０４に固定した後に行っても良い。

【００５４】次いで、上述した光ケーブルＣの分岐部分の両端同士を近づけて、光ケーブルＣを撓ませ、撓ませた状態を維持させる。なお、光ケーブルＣの分岐部分の両端同士を近づけて光ケーブルＣを撓ませ、撓ませた状態を維持するには、上述した各実施形態の光ケーブル分岐具の説明時に述べた方法でそれぞれ行う。光ケーブルＣの撓ませ具合は、どの程度光ケーブルＣの分岐部分の両端同士を近づけるかによって調整できる。このとき、押さえ部材１２３，１２４は、邪魔にならない位置に待避させておく。

【００５５】光ケーブルＣを撓ませると同時に光ケーブルＣに捻りも与える場合は、光ケーブルＣを撓ませた状態からさらに把持部材１０４を保持部１３１（２３１）上で回転させる。光ケーブルＣに撓みと捻りを与えた状態を維持するには、ボルト部１４２に螺合された固定ナット１４３を締め付けることにより、保持部１３１（２３１）を筒状部１４１と固定ナット１４３とで挟み込むことにより行う。

【００５６】光ケーブルＣに捻りを与えるのは一時的なものであるので、一対の固定ナット１４３の内の一方のみを締め付ければ良く、双方の固定ナット１４３を締め付ける必要はない。なお、上述した実施形態の光ケーブル分岐具においては、保持部１３１（２３１）の形態上、上方に位置する固定ナット１４３を締め付けることはできない。一対のケーブル把持部１０１（２０１，３０１）の双方で光ケーブルＣに対して捻りを与えられるようにしてある場合は、互いに逆方向に回転させて光ケーブルＣに捻りを与える。

【００５７】また、光ケーブルＣに捻りを与える際には、光ケーブルＣのスペーサＳ上に形成された心線収納溝Ｇの螺旋と反対方向に捻る。このようにすることにより、心線収納溝Ｇの螺旋が直線により近くなり、心線収納溝Ｇ内の光ファイバ心線の長さに余裕ができ、光ケーブルＣの撓みと相まって光ファイバ心線を取り出しやすくなる。

【００５８】このようにして、光ケーブルＣを撓ませると同時に捻りを与えた状態で心線収納溝Ｇから光ファイバ心線を浮かし、心線判別機により挟み込んで分岐すべき心線を判別し、ニッパーなどで挟み込んで切断して分岐作業を行う。分岐作業時には、光ファイバ心線を光ケーブルＣから充分に浮かせることができるため、光ファイバ心線に無理な力を作用させて光ファイバを損傷させることなく、作業を容易に行うことができる。

【００５９】光ファイバを分岐させたら、固定ナット１４３を緩めて光ケーブルに与えていた捻りを解放する。次いで、光ケーブルＣを撓ませた状態を維持させる場合には、捻りを解放した位置で固定ナット１４３を再度締め付け、保持部１３１（２３１）に対して把持部材１０４を固定する。このときは、一対の固定ナット１４３の双方を締め付ける。

【００６０】そして、押さえ部材１２３，１２４により撓ませられた状態の光ケーブルＣを押さえる。押さえ部材１２３，１２４は、温度変化などで光ケーブルＣの分岐部分に伸縮が発生しても分岐部分の位置をある程度保持することを目的としているため、必ずしも分岐部分が押さえ部材１２３，１２４と接触していなくても良い。また、各押さえ部材１２３，１２４の両端の間の距離がスリット１２２の幅にほぼ等しくされているため、温度変化により光ケーブルＣの分岐部分が伸張しても、分岐部分は押さえ部材１２３，１２４にガイドされてスリット１２２内に案内される。

【００６１】一方、光ケーブルＣを撓ませた状態を維持させずに、撓みも解放する場合は、先程とは逆の手順を踏んで、光ケーブルＣの分岐部分の両端を遠ざけて光ケーブルＣを伸張させた状態に戻す。撓みを解放した位置で固定ナット１４３を再度締め付け、保持部１３１（２３１）に対して把持部材１０４を固定する。このときは、一対の固定ナット１４３の双方を締め付ける。

【００６２】光ケーブルＣを分岐具から取り外す必要がある場合は、一対のボルト部１４２端部の凹部１４４に六角の棒スパナを嵌合させ、ボルト部１４２を回転させて筒状部１４１の外部側に後退させ、筒状部１４１の内部から光ケーブルＣを取り出す。

【００６３】上述した光ケーブル分岐具及び分岐方法によれば、一対のケーブル把持部１０１（２０１，３０１）により光ケーブルＣの分岐部分の両端を把持し、一対のケーブル把持部１０１（２０１，３０１）により把持した部分同士を近づけることにより、光ケーブルＣを撓ませることができ、光ケーブルＣ内の光ファイバ心線を取り出しやすくすることができる。このとき、光ファイバ心線を光ケーブルＣ本体から充分に浮かせることができ、心線判別機やニッパーなどで挟み込みやすく、光ファイバ心線に損傷を与えてしまうことなく光ファイバを容易に分岐させることができる。

【００６４】また、上述した光ケーブル分岐具及び分岐方法によれば、一対のケーブル把持部１０１（２０１，３０１）により光ケーブルＣの分岐部分の両端を把持し、一対のケーブル把持部１０１（２０１，３０１）の把持部材１０４を回転させることにより、光ケーブルＣに捻りを与えることができ、光ケーブルＣ内の光ファイバ心線を取り出しやすくすることができる。このとき、光ファイバ心線を光ケーブルＣ本体から充分に浮かせることができ、心線判別機やニッパーなどで挟み込みやすく、光ファイバ心線に損傷を与えてしまうことなく光フ

ァイバを容易に分岐させることができる。

【００６５】光ケーブルＣに撓みのみを与えるだけ、あるいは光ケーブルＣに捻りのみを与えるだけでも光ケーブルＣ内から光ファイバを取り出しやすくできるが、光ケーブルＣを撓ませると同時に光ケーブルＣに対して捻りを与えれば、光ファイバをより取り出しやすくなるため好ましい。

【００６６】また、押さえ部材１２３，１２４を設けることにより、光ファイバを分岐させた後に温度変化などによって光ケーブルＣの分岐部分が伸縮しても、光ケーブルＣの撓ませた状態を安定的に維持することができ、伝送特性上長期的な信頼性が得られる。

【００６７】また、スリット１２２を設けることにより、分岐具の大きさに制限されずに光ケーブルＣをより大きく撓ませることができ、より長い余長部分を確保することができ、分岐作業をより行いやすくすることができる。さらに、スリット１２２自体で、光ケーブルＣの分岐部分の位置をある程度拘束することができ、光ケーブルＣの撓ませた状態を安定的に維持することができ、伝送特性上長期的な信頼性が得られる。

【００６８】また、温度変化により光ケーブルＣが伸縮し、その湾曲状態が変化しても、スリット１２２が設けられていると、光ケーブルＣの湾曲状態の変化に対応できる範囲が広くなり、光ケーブルＣ内の光ファイバに外力を与えてしまうのを防止することができる。このようなスリット１２２が設けられていないと、光ケーブルＣの分岐部分が土台部１０２（２０２，３０２Ａ、３０２Ｂ）などと当接し、光ケーブルＣ内の光ファイバに外力が加えられることもあり得る。

【００６９】また、光ケーブルＣを撓ませることにより、光ファイバを損傷させずに容易に光ファイバを分岐させた後に撓みを解消させる場合は、分岐作業時にのみ光ケーブルＣに撓みが与えられ、その他の時には光ケーブルＣに撓みが与えられないため、光ファイバに曲げの歪みが加わらず、信頼性が高くなる。光ファイバを分岐させた後に光ケーブルＣの撓みを解消させるのは、分岐作業が頻繁に繰り返されることがない場合に特に有効である。

【００７０】また、光ケーブルＣに捻りを与えることにより、光ファイバを損傷させずに容易に光ファイバを分岐させた後に捻りを解放させる場合は、分岐作業時にのみ光ケーブルＣに捻りが与えられ、その他の時には光ケーブルＣに捻りが与えられないため、光ファイバに捻りの歪みが加わらず、信頼性が高くなる。

【００７１】また、光ケーブルＣを撓ませることにより、光ファイバを損傷させずに容易に光ファイバを分岐させた後に撓みを維持させる場合は、分岐作業を行う度に何度も光ケーブルＣに撓みを繰り返し与える必要がなくなるため、光ファイバを損傷させるのを防止することができる。また、一度分岐作業を行った分岐部分において他の光ファイバを分岐させる場合に、取付部材１０３や把持部材１０４をその都度移動させる必要がなくなり、既に分岐されている光ファイバの余長部分の移動も最小限に抑えることができ、光ファイバの分岐作業が行いやすくなる。光ファイバを分岐させた後に光ケーブルＣの撓みを維持するのは、分岐作業が度々繰り返されることが予想される場合に特に有効である。

【００７２】また、光ケーブルＣを撓ませると共に光ケーブルＣに捻りを与えることにより、光ケーブルＣに対して撓みのみを与える場合や捻りのみを与える場合に比して、光ファイバ心線を光ケーブル本体からさらに浮かせることができ、光ファイバを損傷させずにより容易に光ファイバを分岐させることができる。また、その後に捻りを解消させ、撓みを維持させる場合に、光ケーブルＣに撓みを繰り返し与える必要がなくなって光ファイバを損傷させるのを防止することができ、取付部材１０３や把持部材１０４をその都度移動させる必要がなくなり、既に分岐されている光ファイバの余長部分の移動も最小限に抑えることができるようになって、光ファイバの分岐作業が行いやすくなる事は上述したとおりである。

【００７３】図１０(a)に示されている光ケーブルＣは、心線収納溝ＧがいわゆるＳ溝やＺ溝といわれる単純な螺旋状に形成されているものである。このような光ケーブルＣの心線収納溝Ｇから光ファイバ心線を取り出すには、上述したように光ケーブルＣを撓ませつつ螺旋と逆方向に捻ると光ファイバ心線をより取り出しやすくなる。一方、図１０(b)に示されている光ケーブルＣは、心線収納溝ＧがいわゆるＳＺ溝といわれる波状に形成されているものである。このような光ケーブルＣの心線収納溝Ｇから光ファイバ心線を取り出すには、光ケーブルＣを撓ませるだけでも光ファイバ心線を取り出しやすくなる場合が多い。

【００７４】このため、図１０(b)に示されるようなＳＺ溝といわれる心線収納溝Ｇを有する光ケーブルに対しては、捻りを与えずに分岐作業を行っても支障が無いことが多く、このような場合は、図９に示されるような分岐具を用いても良い。図９に示される光ケーブル分岐具に関して以下に簡単に説明するが、図９に示される分岐具は上述した図４又は図６に示す分岐具とケーブル把持部のみが異なる。このため、図４又は図６に示される光ケーブル分岐具と同一又は同等の構成部分については同一の符号を付してその詳しい説明を省略する。

【００７５】図9に示される光ケーブル分岐具におけるケーブル把持部４０１は、取付部材４０３と把持部材４０４とからなる。

【００７６】取付部材４０３は、保持部４３１と柱状部２３３とからなる。保持部４３１は、円筒形を有しており、その上部が光ケーブルＣを内部に配置させるために切り欠かれている。また、保持部４３１の両側面には、

ボルト部１４２を螺合させるネジ孔が形成されている。保持部４３１の中央最下端が柱状部２３３に結合されており、保持部４３１は柱状部２３３を介して土台部３０２Aに固定されている。

【００７７】把持部材４０４は、一対のボルト部１４２と、ボルト部１４２に螺合される固定ナット１４３とからなり、ボルト部１４２が上述した保持部４３１に対し て直接螺合される。ボルト部１４２や固定ナット１４３は、上述した実施形態のものと何ら変わるところはないので、ここでの説明は省略する。

【００７８】図９に示される光ケーブル分岐具は、上述したように把持部材４０４が回転しないように構成されているため、光ケーブルCに対して捻りを与えることはできない。しかし、ケーブル把持部４０１を光ケーブルCの延設方向にスライドさせることにより、光ケーブルCを撓ませることができる。ここで、ケーブル把持部４０１を土台部に対してスライドさせる機構は、図１に示されるスライド部１３２、ガイド孔１２１及び回転ギア部１０５を用いた構成としても良い。

【００７９】また、上述した図９に示されるような場合以外にも、光ケーブルCに対して捻りを与えることはできないが、撓みを与えることができる構成としては、図４及び図５に示される光ケーブル分岐具において、ガイドスリット１３４を垂直方向に延設させずに水平方向にのみ延設させる場合が考えられる。

【００８０】本発明の光ケーブル分岐具は、上述した実施形態に限定されるものではない。例えば、上述した光ケーブル分岐具は、何れも押さえ部材１２３，１２４を有していたが、必ずしも有していなくても良い。また、押さえ部材１２３，１２４を設ける場合としては、土台部が接続箱の内壁と一体化されており、光ファイバの分岐後も光ケーブルの撓みを維持させる場合が考えられる。さらに、スリット１２２も、必ずしも設けられなくても良い。

【００８１】また、土台部が作業台上に取り付けられて、分岐作業後に光ケーブルCを分岐具から取り外して所定の場所に戻すようにしても良いし、土台部が光ケーブル接続箱の内壁と一体化されており、分岐作業後の光ケーブルCを接続箱内で分岐具によりそのまま保持するようにしても良い。

【００８２】また、上述した実施形態においては、スペーサタイプの光ケーブルCの内部の光ファイバを分岐させる場合について説明したが、スペーサタイプではないルースチューブタイプの光ケーブルなどの内部の光ファイバを分岐させる際に用いても、損傷を与えずに光ファイバを分岐させやすくなることに変わりはない。

【００８３】また、光ケーブルCを撓ませる場合、上述した実施形態においては下方に撓ませたが、側方や上方に撓ませても良い。このとき、土台部が接続箱の内壁と一体化されているような場合は、撓ませることにより生じるスペースを分岐した光ファイバ心線を収納させておく収納トレイの配置スペースとして利用することもできる。

【００８４】また、押さえ部材を設ける場合に関して、上述の実施形態においては、複数の押さえ部材１２３，１２４により、光ケーブルCの撓みを維持させたが、光ケーブルC（スペーサS）の湾曲形状に合わせた湾曲形状を有する押さえ部材を一つ設けて、この押さえ部材により撓みを維持させても良い。

【００８５】また、スリットを設ける場合に関して、上述した実施形態においては、スリット１２２は土台部を貫通するように形成されたが、温度変化により変化する光ケーブルC（スペーサS）の撓みを収納することができるのであれば、スリットは単なる凹部として形成されても良い。

【００８６】また、上述した光ケーブル分岐具及び分岐方法は、当初は予定していなかった分岐部分に対していわゆる中間後分岐作業を行うときのみならず、当初から後分岐作業を行うことが予想されている場合でも用いることができるのは言うまでもない。

【００８７】

【発明の効果】請求項１～４に記載の何れの発明によっても、一対のケーブル把持部により光ケーブルの分岐部分の両端を把持して、一対のケーブル把持部により把持した部分同士を近づけることにより、光ケーブルを撓ませることができ、光ケーブル内の光ファイバ心線を取り出しやすくすることができる。このとき、光ファイバ心線を光ケーブル本体から充分に浮かせることができ、心線判別機やニッパーなどで挟み込みやすく、光ファイバ心線に損傷を与えてしまうことなく光ファイバを容易に分岐させることができる。

【００８８】請求項５に記載の発明によれば、光ファイバを分岐させた後に温度変化などによって光ケーブルの分岐部分が伸縮しても、光ケーブルの撓ませた状態を維持することができ、伝送特性上長期的な信頼性が得られる。

【００８９】請求項６に記載の発明によれば、分岐具の大きさに制限されずに光ケーブルをより大きく撓ませることができ、より長い余長部分を確保することができ、分岐作業をより行いやすくすることができる。また、光ファイバを分岐させた後も光ケーブルを撓ませた状態で維持する場合などは温度変化により光ケーブルが伸縮して湾曲状態が変化しても、スリットを設けることにより、光ケーブルの湾曲状態の変化に対応できる範囲が広くなり、光ケーブル内の光ファイバに外力を与えてしまうのを防止することができる。

【００９０】請求項７に記載の発明によれば、一対のケーブル把持部により光ケーブルの分岐部分の両端を把持して、一対のケーブル把持部の把持部材を回転させることにより、光ケーブルに捻りを与えることができ、光ケ

ーブル内の光ファイバ心線を取り出しやすくすることができる。このとき、光ファイバ心線を光ケーブル本体から充分に浮かせることができ、心線判別機やニッパーなどで挟み込みやすく、光ファイバ心線に損傷を与えてしまうことなく光ファイバを容易に分岐させることができる。

【００９１】請求項８に記載の発明によれば、光ケーブルを撓ませることにより、光ファイバを損傷させずに容易に光ファイバを分岐させることができ、その後に撓みを解消させることにより、分岐作業時にのみ光ケーブルに撓みを与え、その他の時には光ケーブルＣ撓みを与えないようにして、光ファイバに曲げの歪みを加わえず、信頼性を高くすることができる。この分岐方法は、分岐作業が頻繁に繰り返されることがない場合に特に有効である。

【００９２】請求項９に記載の発明によれば、光ケーブルに捻りを与えることにより、光ファイバを損傷させずに容易に光ファイバを分岐させることができ、その後に捻りを解放させることにより、分岐作業時にのみ光ケーブルに捻りを与え、その他の時には光ケーブルＣに捻りを与えないようにして、光ファイバに捻りの歪みを加わえず、信頼性を高くすることができる。

【００９３】請求項１０に記載の発明によれば、光ケーブルを撓ませることにより、光ファイバを損傷させずに容易に光ファイバを分岐させることができ、その後に撓みを維持させることにより、分岐作業を行う度に何度も光ケーブルに撓みを繰り返し与える必要がないようにし、光ファイバを損傷させるのを防止することができる。また、一度分岐作業を行った分岐部分において他の光ファイバを分岐させる場合に、取付部材や把持部材をその都度移動させる必要がなくなり、既に分岐されている光ファイバの余長部分の移動も最小限に抑えることができ、光ファイバの分岐作業が行いやすくなる。この分岐方法は、分岐作業が度々繰り返されることが予想される場合に特に有効である。

【００９４】請求項１１に記載の発明によれば、光ケーブルを撓ませると共に光ケーブルに捻りを与えることにより、光ケーブルに対して撓みのみを与える場合や捻りのみを与える場合に比して、光ファイバ心線を光ケーブル本体からさらに浮かせることができ、光ファイバを損傷させずにより容易に光ファイバを分岐させることができる。また、その後に捻りを解消させ、撓みを維持させることにより、光ケーブルに撓みを繰り返し与える必要がなくなって、光ファイバを損傷させるのを防止することができる。また、取付部材や把持部材をその都度移動させる必要がなくなり、既に分岐されている光ファイバの余長部分の移動も最小限に抑えることができるようになって、光ファイバの分岐作業が行いやすくなる。

【図面の簡単な説明】

【図１】請求項１及び請求項５～請求項７に記載の光ケーブル分岐具の実施形態を示す側面図である。

【図２】(a)は図１におけるI-I線断面図であり、(b)は図１におけるII-II線断面図である。

【図３】図１に示す光ケーブル分岐具におけるケーブル把持部の土台部に対するスライド機構を示す斜視図である。

【図４】請求項２及び請求項５～請求項７に記載の光ケーブル分岐具の実施形態を示す側面図である。

【図５】図４におけるIII-III線断面図である。

【図６】請求項３及び請求項５～請求項７に記載の光ケーブル分岐具の実施形態を示す側面図である。

【図７】図６に示す光ケーブル分岐具における土台部のスライド機構を示しており、(a)は平面図であり、(b)は(a)におけるIV-IV線断面図であり、(c)は(a)におけるV-V線断面図である。

【図８】請求項４及び請求項５～請求項７に記載の光ケーブル分岐具の実施形態を示す側面図である。

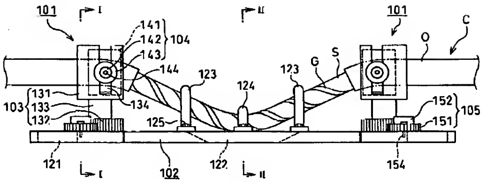
【図９】本発明の光ケーブル分岐具の他の実施形態を示しており、(a)は側面図であり、(b)は(a)におけるVI-VI線断面図である。

【図１０】スペーサタイプの光ケーブルを示す斜視図である。

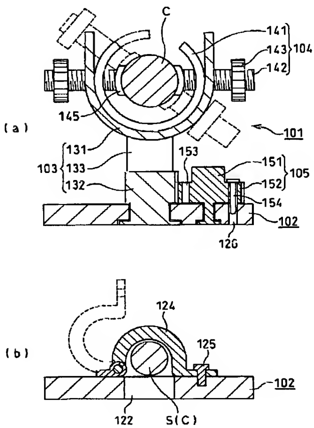
【符号の説明】

１０１，２０１，３０１，４０１…ケーブル把持部、１０２，２０２，３０２Ａ，３０２Ｂ…土台部、３０２ａ…第一土台部、３０２ａ’，３０２ｂ…第二土台部、３０２ｃ…連結部、１０３，２０３，３０３，４０３…取付部材、１０４，２０４，３０４，４０４…把持部材、１２２…スリット、１２３，１２４…押さえ部材、Ｃ…光ケーブル、Ｏ…外被、Ｓ…スペーサ、Ｇ…心線収納溝。

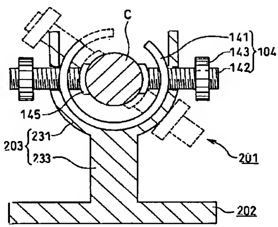
【図1】


101
101
141
142
143
104
144
123
124
123
G
S
O
C
131
133
132
103
134
125
152
151
105
121
102
122
154

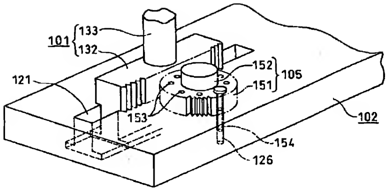
【図2】


(a)
C
141
143
104
142
145
101
131
133
132
103
153
151
152
105
154
102
126
(b)
124
125
102
122
S(C)

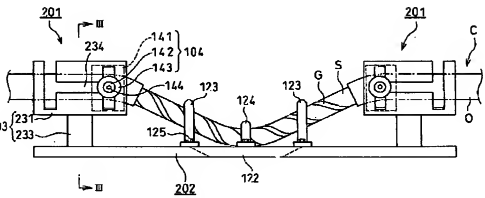
【図5】


C
141
143
104
142
145
231
233
203
201
202

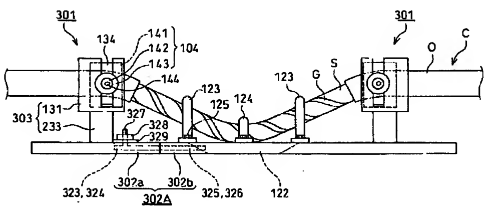
【図３】


101
133
132
121
152
151
105
153
102
154
126

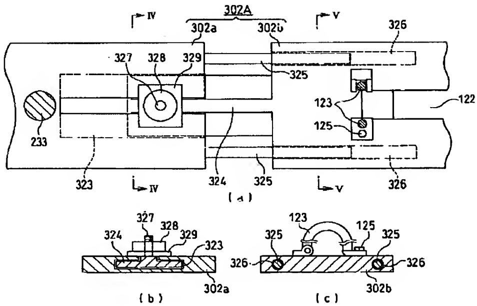
【図４】


201
201
234
141
142
143
104
144
123
123
124
125
G
S
C
O
203
231
233
202
122

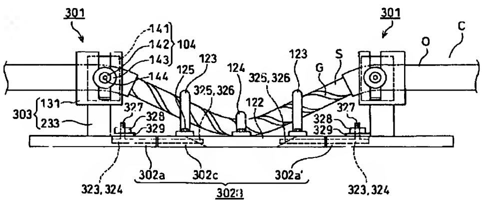
【図６】


301
301
134
141
142
143
104
144
123
123
125
124
G
S
O
C
303
131
233
327
328
329
323, 324
302a
302b
302A
325, 326
122

【図7】

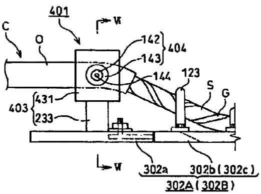

302A
302a
302b
IV
V
326
327
328
329
325
123
122
125
233
323
324
(a)
324
327
328
329
323
302a
(b)
123
125
325
326
302b
(c)

【図8】

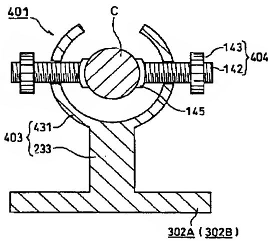

301
301
141
142
143
144
104
123
125
124
325,326
122
G
S
O
C
131
233
303
327
328
329
302a
302c
302a'
302B
323,324

【図9】

(a)

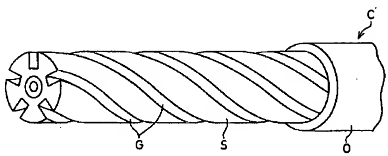

401
C
O
142
143
404
144
123
S
G
431
403
233
Ⅵ
302a
302b(302c)
302A(302B)

(b)

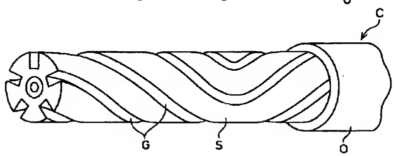

401
C
143
404
142
145
431
403
233
302A(302B)

【図10】

(a)


C
G
S
O

(b)


C
G
S
O

CLAIMS

[Claim(s)]

[Claim 1] A foreground extract means to be image coding equipment which encodes the foreground in a series of images, and to extract a foreground from each screen of said a series of images, Image coding equipment characterized by including an output means to output a prediction coefficient operation means to ask for the prediction coefficient for predicting the foreground of each of said screen from the pixel which constitutes the image of one or more sheets, and said prediction coefficient and said image of one or more sheets, as a coding result of the foreground of each of said screen.

[Claim 2] The back are recording image obtained when the foreground of each of that screen is seen toward the travelling direction of time amount, where alignment of the background of each screen of said a series of images is performed, An are recording image configuration means to constitute the front are recording image obtained when it goes to the travelling direction and hard flow of time amount is included further. Said prediction coefficient operation means Image coding equipment according to claim 1 characterized by asking for the prediction coefficient for predicting the foreground of each of said screen from the pixel which constitutes said back are recording image and a front are recording image.

[Claim 3] Said prediction coefficient operation means is image coding equipment according to claim 1 characterized by asking for the prediction coefficient for linearity-primary-predicting the foreground of each of said screen from the pixel which constitutes the image of one or more sheets.

[Claim 4] Said prediction coefficient operation means is image coding equipment according to claim 1 characterized by asking for the prediction coefficient of one set about the foreground of all the screens of said a series of images.

[Claim 5] Said prediction coefficient operation means is image coding equipment according to claim 1 characterized by asking for the prediction coefficient of one set for every foreground of each screen of said a series of images.

[Claim 6] A forecast operation means to calculate the forecast of the foreground of each of said screen from said image of one or more sheets and prediction coefficient, An error operation means to search for the error over said foreground of said forecast, and an error image generation means to generate the error image which consists of errors of said forecast are included further. Said prediction coefficient operation

means Image coding equipment according to claim 1 characterized by asking for the new prediction coefficient for predicting the foreground of each of said screen from the pixel which newly [image / said / error] constitutes the image of one or more sheets in said image of one or more sheets.

[Claim 7] Said prediction coefficient operation means is image coding equipment according to claim 6 characterized by repeating asking for a new prediction coefficient until the prediction error of said forecast becomes below a predetermined value.

[Claim 8] The foreground extract step which is the image coding approach which encodes the foreground in a series of images, and extracts a foreground from each screen of said a series of images, The image coding approach characterized by including the output step which outputs the prediction coefficient operation step which asks for the prediction coefficient for predicting the foreground of each of said screen from the pixel which constitutes the image of one or more sheets, and said prediction coefficient and said image of one or more sheets as a coding result of the foreground of each of said screen.

[Claim 9] The foreground extract step which is the medium which makes a computer execute the program for performing image coding processing which encodes the foreground in a series of images, and extracts a foreground from each screen of said a series of images, The prediction coefficient operation step which asks for the prediction coefficient for predicting the foreground of each of said screen from the pixel which constitutes the image of one or more sheets, The medium which makes a computer execute the program characterized by including the output step which outputs said prediction coefficient and said image of one or more sheets as a coding result of the foreground of each of said screen.

[Claim 10] It is image decode equipment which decodes the coded data which encoded a series of images. The image of said coded data to one or more sheets, Image decode equipment characterized by including a separation means to separate the prediction coefficient for predicting the foreground of each screen of said a series of images from the pixel which constitutes the image of one or more sheets, and a forecast operation means to calculate the forecast of the foreground of each of said screen from said image of one or more sheets and prediction coefficient.

[Claim 11] Said image of one or more sheets is image decode equipment according to claim 10 characterized by including the back are recording image obtained when the foreground of each of that screen is seen toward the travelling direction of time amount, where alignment of the background of each screen of said a series of images is performed, and the front are recording image obtained when it goes to the travelling

direction and hard flow of time amount.

[Claim 12] Said image of one or more sheets is image decode equipment according to claim 11 characterized by including further the error image which becomes by the prediction error over said foreground of the forecast of the foreground of each of said screen.

[Claim 13] Said forecast operation means is image decode equipment according to claim 10 characterized by linearity-primary-predicting the foreground of each of said screen.

[Claim 14] Said extract means is image decode equipment according to claim 10 characterized by including further a synthetic means to be also separating the background of said a series of images, and compounding said background and the forecast of said foreground from said coded data, and to decode each screen of said a series of images.

[Claim 15] It is the image decode approach which decodes the coded data which encoded a series of images. The image of said coded data to one or more sheets, The image decode approach characterized by including the separation step which separates the prediction coefficient for predicting the foreground of each screen of said a series of images from the pixel which constitutes the image of one or more sheets, and the forecast operation step which calculates the forecast of the foreground of each of said screen from said image of one or more sheets and prediction coefficient.

[Claim 16] It is the medium which makes a computer execute the program for performing image decode processing which decodes the coded data which encoded a series of images. The image of said coded data to one or more sheets, The separation step which separates the prediction coefficient for predicting the foreground of each screen of said a series of images from the pixel which constitutes the image of one or more sheets, The medium which makes said computer execute the program characterized by including the forecast operation step which calculates the forecast of the foreground of each of said screen from said image of one or more sheets and prediction coefficient.

[Claim 17] It is an image processing system equipped with the image coding equipment which encodes the foreground in a series of images, and the image decode equipment which decodes the coded data which said image coding equipment outputs. A foreground extract means by which said image coding equipment extracts a foreground from each screen of said a series of images, A prediction coefficient operation means to ask for the prediction coefficient for predicting the foreground of

each of said screen from the pixel which constitutes the image of one or more sheets, An output means to output said prediction coefficient and said image of one or more sheets as said coded data which it is as a result of [of the foreground of each of said screen] coding is included. Said image decode equipment The image processing system characterized by including a separation means to separate said image and prediction coefficient of one or more sheets from said coded data, and a forecast operation means to calculate the forecast of the foreground of each of said screen from said image of one or more sheets and prediction coefficient.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention encodes an image efficiently about an image processing system in image coding equipment and the image coding approach, image decode equipment and the image decode approach, a medium, and a list, and relates to an image processing system at the image coding equipment which enables it to decode the coded data obtained by the coding and the image coding approach, image decode equipment and the image decode approach, a medium, and a list.

[0002]

[Description of the Prior Art] Conventionally, it considers as the approach of carrying out compression coding of the image, for example, there is object coding. In object coding, the foreground and background are extracted from a series of images (one scene or image of 1 cut) (for example, frame from a certain scene change to the next scene change etc.). That is, when a series of images consist of N frames, the background (in a video camera, if this background is panning or the scene photoed by carrying out chill TINGU, it will serve as an oblong or longwise image) of the whole 1 scene displayed with that N frame, and the foreground which exists in common in the N frame are extracted. And decode of the data obtained by object coding is performed by arranging a foreground for a background.

[0003]

[Problem(s) to be Solved by the Invention] By the way, in coding which extracts a foreground and a background, how the extracted foreground is encoded influences the coding effectiveness greatly like above-mentioned object coding, for example.

[0004] This invention is made in view of such a situation, and enables it to encode the

foreground in a series of images efficiently.

[0005]

[Means for Solving the Problem] The image coding equipment of this invention is characterized by including an output means to output a prediction coefficient operation means to ask for the prediction coefficient for predicting the foreground of each screen, and a prediction coefficient and the image of one or more sheets, as a coding result of the foreground of each screen from the pixel which constitutes a foreground extract means to extract a foreground from each screen of a series of images, and the image of one or more sheets.

[0006] In this image coding equipment, where alignment of the background of each screen of a series of images is performed The back are recording image obtained when the foreground of each of that screen is seen toward the travelling direction of time amount, An are recording image configuration means to constitute the front are recording image obtained when it goes to the travelling direction and hard flow of time amount can be established further. In this case for a prediction coefficient operation means It can be made to ask for the prediction coefficient for predicting the foreground of each screen from the pixel which constitutes a back are recording image and a front are recording image.

[0007] A prediction coefficient operation means can be made to be asked for the prediction coefficient for linearity-primary-predicting the foreground of each screen from the pixel which constitutes the image of one or more sheets. Moreover, a prediction coefficient operation means can be made to be asked for the prediction coefficient of one set about the foreground of all the screens of a series of images. Furthermore, a prediction coefficient operation means can be made to be asked for the prediction coefficient of one set for every foreground of each screen of a series of images.

[0008] A forecast operation means to ask the image coding equipment of this invention for the forecast of the foreground of each screen from the image of one or more sheets, and a prediction coefficient, An error operation means to search for the error over the foreground of a forecast, and an error image generation means to generate the error image which consists of errors of a forecast can be established further. In this case, a prediction coefficient operation means can be made to be asked for the new prediction coefficient for predicting the foreground of each screen from the pixel which newly [image / error] constitutes that image of one or more sheets in the image of one or more sheets.

[0009] A prediction coefficient operation means can be made to repeat asking for a

new prediction coefficient until the prediction error of a forecast becomes below a predetermined value.

[0010] The image coding approach of this invention is characterized by including the output step which outputs the prediction coefficient operation step which asks for the prediction coefficient for predicting the foreground of each screen, and a prediction coefficient and the image of one or more sheets as a coding result of the foreground of each screen from the pixel which constitutes the foreground extract step which extracts a foreground from each screen of a series of images, and the image of one or more sheets.

[0011] The program which the medium of this invention makes a computer execute is characterized by including the output step which outputs the prediction coefficient operation step which asks for the prediction coefficient for predicting the foreground of each screen, and a prediction coefficient and the image of one or more sheets as a coding result of the foreground of each screen from the pixel which constitutes the foreground extract step which extracts a foreground from each screen of a series of images, and the image of one or more sheets.

[0012] The image decode equipment of this invention is characterized by including a separation means to separate the prediction coefficient for predicting the foreground of each screen of a series of images from the pixel which constitutes the image and the image of one or more sheets of one or more sheets from coded data, and a forecast operation means to calculate the forecast of the foreground of each screen from the image of one or more sheets, and a prediction coefficient.

[0013] The back are recording image obtained when the foreground of each of that screen is seen toward the travelling direction of time amount, where alignment of the background of each screen of a series of images is performed, and the front are recording image obtained when it goes to the travelling direction and hard flow of time amount can be included in the image of one or more sheets. Moreover, the error image which becomes by the prediction error over the foreground of the forecast of the foreground of each screen can be further included in the image of one or more sheets.

[0014] A forecast operation means can be made to linearity-primary-predict the foreground of each screen.

[0015] From coded data, the background of a series of images can also be made to be able to divide into an extract means, and a synthetic means to decode each screen of a series of images can be further formed in it by compounding a background and the forecast of a foreground in this case.

[0016] The image decode approach of this invention is characterized by including the

separation step which separates the prediction coefficient for predicting the foreground of each screen of a series of images from the pixel which constitutes the image and the image of one or more sheets of one or more sheets from coded data, and the forecast operation step which calculates the forecast of the foreground of each screen from the image of one or more sheets, and a prediction coefficient.

[0017] The program which the medium of this invention makes a computer execute is characterized by including the separation step which separates the prediction coefficient for predicting the foreground of each screen of a series of images from the pixel which constitutes the image and the image of one or more sheets of one or more sheets from coded data, and the forecast operation step which calculates the forecast of the foreground of each screen from the image of one or more sheets, and a prediction coefficient.

[0018] A foreground extract means by which the image processing system of this invention extracts a foreground from each screen of a series of images, A prediction coefficient operation means to ask for the prediction coefficient for predicting the foreground of each screen from the pixel which constitutes the image of one or more sheets, An output means to output a prediction coefficient and the image of one or more sheets as coded data which it is as a result of [of the foreground of each screen] coding, It is characterized by including a separation means to separate the image and prediction coefficient of one or more sheets from coded data, and a forecast operation means to calculate the forecast of the foreground of each screen from the image of one or more sheets, and a prediction coefficient.

[0019] In a medium, a foreground is extracted from each screen of a series of images by the image coding equipment of this invention and the image coding approach, and the list, and the prediction coefficient for predicting the foreground of each screen is called for from the pixel which constitutes the image of one or more sheets. And a prediction coefficient and the image of one or more sheets are outputted as a coding result of the foreground of each screen.

[0020] In a medium, the prediction coefficient for predicting the foreground of each screen of a series of images is separated from the pixel which constitutes the image and the image of one or more sheets of one or more sheets from coded data by the image decode equipment of this invention and the image decode approach, and the list, and they are asked for the forecast of the foreground of each screen from the image of one or more sheets and prediction coefficient.

[0021] In the image processing system of this invention, a foreground is extracted from each screen of a series of images, and the prediction coefficient for predicting

the foreground of each screen is called for from the pixel which constitutes the image of one or more sheets. And the prediction coefficient and the image of one or more sheets are outputted as coded data which it is as a result of [of the foreground of each screen] coding. On the other hand, the image and prediction coefficient of one or more sheets are separated from coded data, and the forecast of the foreground of each screen is calculated from the image of one or more sheets, and a prediction coefficient.

[0022]

[Embodiment of the Invention] Drawing 1 shows the example of a configuration of the gestalt of 1 operation of the image transmission equipment which applied this invention.

[0023] The digital image data as an image (here, it considers as a dynamic image) set as the object of coding photoed with the video camera etc. are supplied, the image is encoded by the encoder 1 and the coded data obtained as a result is outputted to it there. This coded data is transmitted through the transmission media 3, such as a satellite circuit, and a ground wave, a CATV (Cable Television) network, the Internet, ISDN (Integrated Service Digital Network), or is recorded on the record media 4, such as an optical disk, and a magneto-optic disk, a magnetic disk, a magnetic tape, a phase change disk.

[0024] The coded data transmitted through a transmission medium 3 or the coded data reproduced from a record medium 4 is supplied to a decoder 2, in a decoder 2, the coded data supplied there is decoded, and the decode image obtained as a result is supplied and displayed on the monitor which is not illustrated, for example.

[0025] The above image transmission equipment is applicable to the equipment which transmits and receives an image in the distant location, for example, the equipment which performs record playback of an image.

[0026] Next, drawing 2 shows the example of a configuration of the encoder 1 of drawing 1 .

[0027] The are recording section 11 consists of semiconductor memory, a magnetic disk, etc., and stores temporarily the image data supplied to an encoder 1. Here, image data is inputted and memorized by the are recording section 11, for example per frame of a series of images, such as from a certain scene change until [of a degree] a scene change. In addition, as shown in drawing 3 , the image data of the N frame which becomes by the 1st frame thru/or the Nth frame shall be memorized by the are recording section 11 as a series of images here, for example.

[0028] If the image of the N frame as a series of images is memorized by the are

recording section 11, the camera motion detecting element 12 will read the image of the N frame from the are recording section 11, and will detect the camera motion vector showing the direction and magnitude of a camera motion in each frame.

[0029] That is, the camera motion detecting element 12 sets the camera motion vector v1 of the 1st frame as 0 (= (0 0)) in the system of coordinates (suitably henceforth standard coordinates) which make the right or down [a top to] a x axis or the y-axis from the left, respectively while making a zero the point at the upper left of the 1st frame, as shown in drawing 4 (A). And about the 2nd frame thru/or the Nth frame, the camera motion detecting element 12 searches for the coordinate (x y) of the criteria seat table system in which the point at the upper left of the n-th frame is located as the camera motion vector vn of the n-th frame, when alignment of the background of each frame is performed.

[0030] After the camera motion detecting element 12 sets the camera motion vector v1 of the 1st frame as 0, as shown in drawing 4 (B), in standard coordinates, it asks for the location of the 1st frame and the 2nd frame whose backgrounds correspond, and, specifically, searches for the coordinate of the point at the upper left of [in the location] the 2nd frame as the camera motion vector v2. Furthermore, as shown in drawing 4 (C), in standard coordinates, the camera motion detecting element 12 asks for the location of the 1st frame which performed alignment of a background and the 2nd frame, and the 3rd frame whose backgrounds correspond, and searches for the coordinate of the point at the upper left of [in the location] the 3rd frame as the camera motion vector v3.

[0031] Hereafter, the camera motion detecting element 12 calculates the camera motion vector v4 of the 4th frame thru/or the Nth frame thru/or vN similarly.

[0032] In addition, in order to simplify explanation, as a camera motion, only a motion of a perpendicular direction is considered and let revolutions be level and the thing which is not considered here. However, this invention can be applied even when a camera motion has a revolution.

[0033] The camera motion vector v1 of the 1st frame thru/or the Nth frame as a series of images detected by the camera motion detecting element 12 as mentioned above thru/or vN are supplied to the camera motion vector storage section 13, and is memorized.

[0034] When the camera motion vector v1 thru/or vN are memorized, in the camera motion vector storage section 13 the background extract section 14 While reading the camera motion vector v1 thru/or vN from the camera motion vector storage section 13 Read the image data of the 1st frame thru/or the Nth frame from the are recording

section 11, and by performing alignment of the background of the 1st frame thru/or the Nth frame based on the camera motion vector v1 thru/or vN the 1st frame thru/or that the Nth frame background of the whole (this background -- for example, a series of images -- a video camera -- panning -- or if chill TINGU is carried out and a photograph is taken, it will become an oblong or longwise image) (suitably henceforth a whole background) are extracted. The whole background extracted in the background extract section 14 is supplied to the background memory 15, and is memorized.

[0035] In the background memory 15, if a whole background is memorized, the foreground coding section 16 detects the background of each frame memorized by the are recording section 11 among the whole background based on the camera motion vector of each frame memorized by the camera motion vector storage section 13, will be subtracting the background of each of that detected frame from the image of each frame, and will extract the foreground of each frame. Furthermore, the foreground coding section 16 encodes the foreground of each frame, and outputs the coding result to MUX(multiplexer) 17.

[0036] From the foreground coding section 16, if the coding result of a foreground is received, MUX17 will multiplex the camera motion vector memorized by the camera motion vector storage section 13 and the whole background memorized by the background memory 15 to the coding result of the foreground, and will output the multiplexing result to it as coded data.

[0037] In an encoder 1, image data is encoded per a series of images as mentioned above.

[0038] Next, drawing 5 shows the example of a configuration of the camera motion detecting element 12 of drawing 2 .

[0039] A series of images memorized by the are recording section 11 (drawing 2) are supplied to the center-of-gravity calculation section 21 per frame, and the center-of-gravity calculation section 21 asks it for a center of gravity which is later mentioned about each frame. Furthermore, the center-of-gravity calculation section 21 sets up the range (suitably henceforth the motion detection range) used for detecting the camera motion vector of the attention frame currently observed to the are recording image mentioned later memorized in the are recording image memory 24, and also searches for the center of gravity of the motion detection range. The center of gravity of the attention frame called for in the center-of-gravity calculation section 21 and the motion detection range is supplied to the vector detecting element 22.

[0040] The vector detecting element 22 is supplied to the write-in control section 23

while it detects the camera motion vector of an attention frame and supplies it to the camera motion vector storage section 13 (drawing 2) based on the center of gravity of the attention frame supplied from the center-of-gravity calculation section 21, and the motion detection range.

[0041] The write-in control section 23 controls the address with which the are recording image memory 24 memorizes the image data of an attention frame based on the camera motion vector from the vector detecting element 22. From the are recording section 11 (drawing 2), the are recording image memory 24 reads the image data of an attention frame, and memorizes it to the address specified by the write-in control section 23.

[0042] Next, with reference to drawing 6 , the camera motion detection processing performed in the camera motion detecting element 12 of drawing 5 in which a camera motion vector is detected is explained.

[0043] The point at the upper left of [in the condition of having performed alignment of each frame and having performed the alignment] each frame is detected as a camera motion vector of each frame so that the center of gravity of each frame may be in agreement fundamentally paying attention to the center of gravity of an image moving the camera motion detection processing which the camera motion detecting element 12 performs by camera motion.

[0044] That is, if the n-th frame is now used as an attention frame, the image in the condition of having performed alignment of the background of each frame in the are recording image memory 24, and having laid the 1st thru/or the image data of the n-1st frame which is a frame to the frame in front of an attention frame on top of it in the sequence (are recording image) is memorized.

[0045] In this case, the center-of-gravity calculation section 21 searches for the center of gravity cn of the n-th frame which is an attention frame, as shown in drawing 6 (A). Furthermore, as shown in drawing 6 (B), the center-of-gravity calculation section 21 makes the range which includes the n-1st frame in front of one of the attention frames in the are recording image memorized in the are recording image memory 24 the motion detection range, and searches for the center of gravity c of the motion detection range. Here, as motion detection range, the range where only the predetermined number of pixels is large is set up in each direction of four directions of the n-1st frame, for example.

[0046] By the vector detecting element 22, if the center of gravity cn of an attention frame and the center of gravity c of the motion detection range are searched for, as shown in drawing 6 (C), the location of the point at the upper left of [in the condition

that the center of gravity cn of an attention frame was in agreement with the center of gravity c of the motion detection range] an attention frame will be called for, and the coordinate of the location will be outputted as a camera motion vector vn of the n-th frame which is an attention frame.

[0047] That is, considering the n-th frame as an attention frame, in asking for the camera motion vector vn, it has already found the camera motion vector of a before [one of them]. Then, as shown in drawing 6 (C), while expressing the location on the basis of the point at the upper left of [of the center of gravity c of the motion detection range] the n-1st frame with vector v'c Supposing it expresses with vector v'cn the location on the basis of the point at the upper left of [of the center of gravity cn of the n-th frame which is an attention frame / the] the n-th frame The coordinate in the standard coordinates of the location of the point at the upper left of [in the condition that the center of gravity c of the motion detection range and the center of gravity cn of an attention frame were in agreement] an attention frame serves as the motion vector vn of an attention frame. And it can ask for this camera motion vector vn by subtracting vector v'cn which adds vector v'c showing the location of the center of gravity c of the motion detection range to motion vector vn-1 in front of one attention frame of the n-1st frame, and expresses the location of the center of gravity cn of an attention frame to it further. That is, it can ask for the camera motion vector vn of an attention frame by calculating formula vn=vn-1+v'c-v'cn.

[0048] After the camera motion vector vn of an attention frame is called for as mentioned above, in the write-in control section 23, the write-in address for writing in the image data of the attention frame in the are recording image memory 24 is controlled based on the camera motion vector vn. Namely, thereby, in standard coordinates, the image data of an attention frame is written in the point shown by the camera motion vector vn in the form to overwrite, and the image obtained as a result of the writing is used for it by using the following frame [n+1st] as an attention frame in the are recording image memory 24 as an are recording image at the time of detecting the camera motion vector vn+1 so that the point of the upper left may be located.

[0049] Next, with reference to the flow chart of drawing 7 , the camera motion detection processing in the camera motion detecting element 12 of drawing 5 is explained further.

[0050] While reading appearance of the 1st frame of a series of images memorized by the are recording section 11 is carried out as an attention frame and it is first supplied

to the center-of-gravity calculation section 21, the storage value of the are recording image memory 24 is cleared.

[0051] And in the center-of-gravity calculation section 21, it is judged in step S1 whether there is any 1st attention frame. In step S1, when judged with there being the 1st attention frame, it progresses to step S2, and the vector detecting element 22 sets up 0 as the camera motion vector v1, outputs it to the camera motion vector storage section 13 and the write-in control section 23, and progresses to step S6.

[0052] Based on the camera motion vector from the vector detecting element 22, the write-in control section 23 controls the write-in address in the are recording image memory 24 by step S6, and, thereby, writes an attention frame in the are recording image memory 24 at it. That is, in now, there is the 1st attention frame, and since the camera motion vector v1 is 0, the image data of the 1st frame is written in in the are recording image memory 24 so that the point of the upper left may be located in the zero in standard coordinates.

[0053] Then, it progresses to step S7, and when judged with it being judged whether there is any following frame which constitutes a series of images, and occurring by the are recording section 11, reading appearance of the following frame is newly carried out to it as an attention frame, and it is supplied to it at the center-of-gravity calculation section 21. And the same processing is repeated by step S1 return and the following.

[0054] When it is judged with there not being the 1st attention frame in step S1 on the other hand (i.e., when it is either the 2nd frame or thru/or the Nth frame), it progresses to step S3, and in the center-of-gravity calculation section 21, center-of-gravity calculation processing in which the center of gravity of an attention frame is searched for is performed, and it progresses to step S4. In step S4, in the center-of-gravity calculation section 21, the motion detection range to an attention frame is set up into the are recording image memorized in the are recording image memory 24, center-of-gravity calculation processing in which the center of gravity of the motion detection range is searched for is performed, and it progresses to step S5.

[0055] At step S5, in the vector detecting element 22, as drawing 6 explained, the camera motion vector of an attention frame is called for, and it is outputted to the camera motion vector storage section 13 and the write-in control section 23 from the center of gravity of the attention frame called for in the center-of-gravity calculation section 21, and the center of gravity of the motion detection range.

[0056] And as progressed and mentioned above to step S6, in the write-in control section 23, based on the camera motion vector from the vector detecting element 22,

the write-in address in the are recording image memory 24 is controlled, and, thereby, an attention frame is written in the are recording image memory 24. That is, in the are recording image memory 24, in standard coordinates, the image data of an attention frame is written in the point shown by the camera motion vector of an attention frame so that the point of the upper left may be located (overwritten).

[0057] Then, as progressed and mentioned above to step S7, when it is judged whether the following frame which constitutes a series of images is in the are recording section 11 and it is judged with there being nothing (i.e., when the 1st which constitutes a series of images thru/or the camera motion vector of each Nth frame are called for), camera motion detection processing is ended.

[0058] Next, with reference to the flow chart of drawing 8 , the processing (center-of-gravity calculation processing of an attention frame) which the center-of-gravity calculation section 21 performs is explained in full detail in step S3 of drawing 7 .

[0059] First, in step S11, to Variables X or Y, the number of pixels beside an attention frame (horizontal direction) or the vertical (perpendicular direction) number of pixels is set, respectively, and progresses to step S12.

[0060] -1 as initial value is set to the variable y which expresses the y-coordinate of each pixel of an attention frame with step S12, it progresses to step S22, and the increment of the variable y is carried out only for 1.

[0061] Here, the coordinate of each pixel which constitutes an attention frame makes the pixel on the leftmost a zero, shall take a x axis or the y-axis from the left from a top to the right or down, respectively, and shall express it.

[0062] Then, it progresses to step S14 and it is judged whether Variable y is under the number Y of pixels of the length of an attention frame. In step S14, when judged with Variable y being under Y, it progresses to step S15, and -1 as initial value is set to the variable x showing the x-coordinate of each pixel of an attention frame, and it progresses to step S16.

[0063] At step S16, the increment only of 1 is carried out, Variable x progresses to step S17, and it is judged whether Variable x is under the number X of pixels beside an attention frame. In step S17, when judged with Variable x not being under X, the same processing is repeated by step S13 return and the following.

[0064] Moreover, in step S17, when judged with Variable x being under X, it progresses to step S18, the pixel p (x y) in a coordinate (x y) is made into an attention pixel, and the attention pixel is classified into either of the level set up beforehand based on the pixel value.

[0065] That is, with the gestalt of this operation, the range of the value which can be taken as a pixel value is beforehand divided into some range. And if the range of the value which can be taken as a now, for example, pixel, value shall be divided into K range and this K range shall be called level 1, 2, ..., K in an order from the range where a pixel value is small, at step S18, an attention pixel will be classified according to whether a pixel value belongs to level 1 thru/or which range of the K.

[0066] Furthermore, the level classification result of an attention pixel is registered into a level table at step S18.

[0067] The center-of-gravity calculation section 21 Namely, among those, the frequency fk of the pixel which belongs to the memory (not shown) to harbor at the level k about each level k (k= 1, 2, ..., K) as shown in drawing 9 , When the level table which matched integrated value sigmaxk of the x-coordinate of the pixel belonging to level k and integrated value sigmayk of a y-coordinate is memorized, for example, the pixel value of an attention pixel belongs to level k While only 1 increments the frequency fk about the level k in a level table, the x-coordinate or y-coordinate of an attention pixel is added to integrated value sigmaxk of an x-coordinate, or integrated value sigmayk of a y-coordinate, respectively.

[0068] In addition, a level table is cleared by 0 whenever processing according to the flow chart of drawing 8 is started.

[0069] And the same processing is repeated by step S16 return and the following.

[0070] It processes by making into an attention pixel each pixel which constitutes an attention frame on the other hand when judged with Variable y not being under Y in step S14, and when all the pixels that constitute an attention frame are registered into a level table, it progresses to step S19 and the center of gravity of the pixel belonging to each level of a level table is searched for. That is, the coordinate (sigmaxk/fk, sigmayk/fk) as which the division of integrated value sigmaxk of the x-coordinate in each level k of a level table or each integrated value sigmayk of a y-coordinate is done in the frequency fk, and it is expressed in step S19 with the division value is searched for as a center of gravity of the pixel belonging to each level k.

[0071] and the step S20 -- progressing -- level 1 thru/or K -- it is alike, respectively, and the center of gravity of the center of gravity of the pixel which belongs is searched for as a center of gravity of the whole pixel which constitutes an attention frame, and carries out a return.

[0072] namely, -- step S20 -- level 1 thru/or K -- it is alike, respectively, and the weighting average which makes weight the frequency f1 thru/or fK is calculated about the center of gravity of the pixel which belongs, and it is outputted as a center of

gravity of the whole pixel where the weighting average constitutes an attention frame.

[0073] Next, with reference to the flow chart of drawing 10 , the processing (center-of-gravity calculation processing of the motion detection range) which the center-of-gravity calculation section 21 performs is explained in full detail in step S4 of drawing 7 .

[0074] First, the motion detection range is set up in step S31. That is, at step S31, the range where the frame in front of one attention frame was written in is detected from the are recording image memorized in the are recording image memory 24. Furthermore, at step S31, the detected range can extend only the predetermined number of pixels for example, in the direction of four directions, respectively, and the range which was able to be extended is set up as motion detection range.

[0075] And it progresses to step S32, and to Variables X or Y, the number of pixels beside the motion detection range or the vertical number of pixels is set, respectively, and progresses to step S33.

[0076] Then, in step S33 thru/or S41, step S12 of drawing 8 thru/or the respectively same processing as the case in S20 are performed, and thereby, the center of gravity of the whole pixel which constitutes the motion detection range is searched for, and carries out a return.

[0077] In the camera motion detecting element 12, the predetermined range containing the frame in front of one of the attention frames in an are recording image is set up as motion detection range. As mentioned above, the center of gravity of the motion detection range, Since the center of gravity of an attention frame is computed, and it asks for the camera motion vector of an attention frame based on those centers of gravity and was made to repeat writing an attention frame in an are recording image based on the camera motion vector As compared with the case where the so-called block matching is performed, it can ask for a camera motion vector simply.

[0078] In addition, although the center of gravity of an attention frame is searched for and the center of gravity of the motion detection range was searched for in step S4 after that in step S3 with the gestalt of operation of drawing 7 , you may ask for whichever first and the center of gravity of an attention frame and the center of gravity of the motion detection range can also be made to ask simultaneously.

[0079] Next, although it asked for each pixel which constitutes the attention frame for the center of gravity of an attention frame with the gestalt of operation of drawing 8 by classifying into either of some level according to the pixel value (suitably henceforth a level classification) In addition to this, the center of gravity of an

attention frame for example, each pixel which constitutes the attention frame It is also possible to carry out based on some pixels (for self to be included and for it not to be necessary to include) around it by classifying into either of some classes (suitably henceforth a class classification).

[0080] Here, a class classification is explained briefly. A now, for example, attention, pixel shall constitute the tap (suitably henceforth a class tap) used for the class classification of an attention pixel from the 4 pixels which adjoins vertically and horizontally, respectively, and own a total of 5 pixels of an attention pixel. If a pixel value shall be expressed by 1 bit in this case (it becomes the value of either 0 or 1), an attention pixel can be classified into the pattern of 32 (= (21) 5) according to the pixel value which 5 pixels of the class tap constituted about that attention pixel can take. It is such a pattern part injury class classification, and an attention pixel will be classified into either of the classes of 32 when it is now.

[0081] In addition, if the class tap which becomes by 5 pixels as mentioned above is constituted and a class classification is generally performed when 8 bits is assigned to the pixel although about 8 bits is assigned to a pixel, the number of classes will turn into a huge number called (28) 5.

[0082] Then, to the class tap constituted about an attention pixel, L bit ADRC (Adaptive Dynamic Range Coding) processing is carried out, and a class classification can be performed based on the class tap after the ADRC processing.

[0083] Here, in L bit ADRC processing, for example, Maximum MAX and the minimum value MIN of a pixel value of a pixel which constitute a class tap are detected, DR=MAX-MIN is used as the local dynamic range of a set, and the pixel which constitutes a class tap is re-quantized by L bits based on this dynamic range DR. That is, out of the pixel value of the pixel which constitutes a class tap, the minimum value MIN is subtracted and the division (quantization) of the subtraction value is done by DR/2L. Therefore, when L bit ADRC processing of the class tap is carried out, as compared with the case where a class classification is performed without carrying out ADRC processing of the class tap, the number of classes can be decreased by the pixel value of each pixel which constitutes the class tap being made into L bits, and considering as a value smaller than the number of bits to which L was assigned by the pixel.

[0084] In addition, moreover, when the pixel of the upper bed of a frame, a soffit, a left end, or a right end turns into an attention pixel, since the pixel which adjoins the left or the right the bottom does not exist, it shall constitute a class tap, assuming it to be that to which the same frame turns up and exists in a frame upside, the bottom,

left-hand side, or right-hand side in this case.

[0085] Next, by carrying out the class classification of each pixel which constitutes an attention frame with reference to the flow chart of drawing 11 based on the class tap about the pixel explains the processing (center-of-gravity calculation processing of an attention frame) performed in the center-of-gravity calculation section 21 in the case of searching for the center of gravity of an attention frame.

[0086] In this case, in step S51 thru/or S57, step S11 of drawing 8 thru/or the respectively same processing as the case in S17 are performed. And the pixel p (x y) in a coordinate (x y) is made into an attention pixel, and a class tap is constituted from step S58 corresponding to step S18 of drawing 8 by the attention pixel. And based on the class tap, the class classification of the attention pixel is carried out at either of the K classes, and the class classification result is registered into a class table.

[0087] In the gestalt of operation of drawing 11 namely, the center-of-gravity calculation section 21 In the memory to build in, for example, the frequency fk of the pixel which belongs to the class k about each class k (k= 1, 2, ..., K) as shown in drawing 12 , When the class table which matched integrated value sigmaxk of the x-coordinate of the pixel belonging to Class k and integrated value sigmayk of a y-coordinate is memorized, for example, an attention pixel belongs to Class k While only 1 increments the frequency fk about the class k in a class table, the x-coordinate or y-coordinate of an attention pixel is added to integrated value sigmaxk of an x-coordinate, or integrated value sigmayk of a y-coordinate, respectively.

[0088] In addition, a class table is cleared by 0 whenever processing according to the flow chart of drawing 11 is started like a level table.

[0089] The same processing is repeated by step S56 return and the following after processing of step S58.

[0090] On the other hand, when judged with Variable y not being under Y in step S54, it progresses to step S59 and the center of gravity of the pixel belonging to each class of a class table is searched for. That is, the coordinate (sigmaxk/fk, sigmayk/fk) as which the division of integrated value sigmaxk of the x-coordinate in each class k of a class table or each integrated value sigmayk of a y-coordinate is done in the frequency fk, and it is expressed in step S59 with the division value is searched for as a center of gravity of the pixel belonging to each class k.

[0091] and the step S60 -- progressing -- a class 1 thru/or K -- it is alike, respectively, and the center of gravity of the center of gravity of the pixel which belongs is searched for as a center of gravity of the whole pixel which constitutes an attention frame, and carries out a return.

[0092] namely, -- step S60 -- a class 1 thru/or K -- it is alike, respectively, and the weighting average which makes weight the frequency f1 thru/or fK is calculated about the center of gravity of the pixel which belongs, and it is outputted as a center of gravity of the whole pixel where the weighting average constitutes an attention frame.
[0093] When searching for the center of gravity of an attention frame by carrying out the class classification of each pixel which constitutes an attention frame here based on the class tap about the pixel, it is desirable to make it ask by the center of gravity of the motion detection range also constituting a class tap about each pixel which constitutes the motion detection range, and performing a class classification based on the class tap.
[0094] In addition, in searching for the center of gravity of the motion detection range by performing a class classification, in the processing which showed the flow chart of drawing 11 , it changes to processing of the step S51, and since it is the same as that of the case where processed steps S31 and S32 shown in the flow chart of drawing 10 , and also it is shown in drawing 11 , it omits the explanation.
[0095] Next, although the center of gravity of an attention frame was searched for with the gestalt of operation of drawing 11 using the center of gravity of the pixel belonging to all the classes that carry out the class classification of each pixel which constitutes an attention frame based on the class tap about the pixel, and are obtained as a result, the center of gravity of an attention frame can be made to ask only using the center of gravity of the pixel which belongs to the specific class obtained as a result of for example, a class classification in addition to this.
[0096] That is, the center of gravity of an attention frame can be asked for the class to which the pixel (suitably henceforth an edge pixel) of the part which is an edge belongs as a specific class only using the center of gravity of the pixel (edge pixel) belonging to the specific class (suitably henceforth an edge class).
[0097] Then, when asking with reference to the flow chart of drawing 13 only using the center of gravity of the edge pixel which belongs to an edge class among the class classification results of each pixel which constitutes an attention frame, the processing (center-of-gravity calculation processing of an attention frame) performed in the center-of-gravity calculation section 21 is explained.
[0098] Also in this case, step S11 of drawing 8 thru/or the respectively same processing as the case in S17 are performed in step S71 thru/or S77. And in step S77, when judged with Variable x being under X, it progresses to step S78, the pixel p (x y) in a coordinate (x y) is made into an attention pixel, and the class classification of the attention pixel is carried out like the case in step S58 of drawing 11 .

[0099] Then, it progresses to step S79 and it is judged [the class obtained as a result of the class classification in step S78] for it being an edge class, i.e., an attention pixel, whether it is an edge pixel.

[0100] Here, an attention pixel is classified into either of the 1024 (= (22) 5) classes when performing a class classification, after carrying out 2-bit ADRC processing of the class tap which consists of 5 pixels which was mentioned above, for example. By the way, when 2-bit ADRC processing of the class tap is carried out, the pixel value of the pixel which constitutes the class tap turns into a value of the 00B, 01B, 10B, or the 11B (B expresses that the value arranged before that is a binary number). Therefore, as mentioned above, when a class tap consists of 4 pixels [an attention pixel and / which adjoins the four directions of the attention pixel, respectively] a total of 5 pixels, it sets. While the time of the pixel value of 4 pixels which adjoins vertically and horizontally, respectively being except 00B while the pixel value of an attention pixel is 00B which is the minimum value, and the pixel value of an attention pixel are 11B which is maximum When the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is except 11B, it is thought that the attention pixel is an edge pixel.

[0101] That is, as shown in drawing 14 (A), when the pixel value of an attention pixel is 00B and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 01B, 10B, or the 11B, so to speak, the pixel value is a trough (concave) in the attention pixel. Moreover, as shown in drawing 14 (B), when the pixel value of an attention pixel is 11B and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 00B, 01B, or the 10B, so to speak, the pixel value is a crest (convex) in the attention pixel. Therefore, the attention pixel is an edge pixel when shown in drawing 14 .

[0102] In addition, when the pixel value of an attention pixel is 00B and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 01B, 10B, or the 11B When the pixel value of a **** and an attention pixel is 11B 81 (= 3x3x3x3) passages and the pixel value of 4 pixels which adjoins vertically and horizontally, respectively is 00B, 01B, or the 10B, there are 81 kinds similarly. Therefore, there is a class (edge class) to which an edge pixel belongs 162 (= 81+81) passages.

[0103] When it is judged with an attention pixel not being an edge pixel by drawing 13 in return and step S79 (i.e., when the classes of an attention pixel are not any of the above-mentioned edge classes which have 162 kinds, either), it returns to step S76.

[0104] Moreover, in step S79, when judged with an attention pixel being an edge pixel (i.e., when the class of an attention pixel is either of the above-mentioned edge

classes which have 162 kinds), it progresses to step S80 and the class classification result of an attention pixel is registered into a class table. That is, at step S80, while the increment of the frequency fk about the class k of an attention pixel of a class table as shown in drawing 12 is carried out only for 1, the x-coordinate or y-coordinate of an attention pixel is added to integrated value sigmaxk of an x-coordinate, or integrated value sigmayk of a y-coordinate, respectively.

[0105] In addition, in performing a class classification and registering only an edge class into a class table only about the attention pixel belonging to an edge class with the gestalt of operation of drawing 13 , for example after carrying out 2-bit ADRC processing of the class tap which consists of 5 pixels as mentioned above since registration to a class table is performed, the number K of classes of a class table is set to 162 which is the number of edge classes mentioned above.

[0106] Since it is classified into either of the 1024 classes as the attention pixel was mentioned above when performing a class classification and registering all classes into a class table on the other hand after carrying out 2-bit ADRC processing of the class tap which consists of 5 pixels, the number K of classes of a class table is set to 1024.

[0107] Therefore, in the gestalt of operation of drawing 13 , magnitude (capacity) of a class table can be made small as compared with the case in the gestalt of operation of drawing 11 .

[0108] The same processing is repeated by step S76 return and the following after processing of step S80.

[0109] On the other hand, when judged with Variable y not being under Y in step S74, it progresses to step S81 and the center of gravity of the pixel belonging to each edge class of a class table is searched for. That is, the coordinate (sigmaxk/fk, sigmayk/fk) as which the division of integrated value sigmaxk of the x-coordinate in each edge class k of a class table or each integrated value sigmayk of a y-coordinate is done in the frequency fk, and it is expressed in step S81 with the division value is searched for as a center of gravity of the pixel belonging to each edge class k.

[0110] and the step S82 -- progressing -- the edge class 1 thru/or K -- it is alike, respectively, and the center of gravity of the center of gravity of the pixel which belongs is searched for as a center of gravity of the whole pixel which constitutes an attention frame, and carries out a return.

[0111] namely, -- step S82 -- the edge class 1 thru/or K -- it is alike, respectively, and the weighting average which makes weight the frequency f1 thru/or fK is calculated about the center of gravity of the pixel which belongs, and it is outputted as a center of gravity of the whole pixel where the weighting average constitutes an

attention frame.

[0112] When searching for the center of gravity of an attention frame here only using what belongs to an edge class among the pixels which constitute an attention frame, it is desirable to also search for the center of gravity of the motion detection range only using what belongs to an edge class among the pixels which constitute the motion detection range.

[0113] In addition, in searching for the center of gravity of the motion detection range only using the pixel belonging to an edge class, in the processing shown in the flow chart of drawing 13 , it changes to processing of the step S71, and since it is the same as that of the case where processed steps S31 and S32 shown in the flow chart of drawing 10 , and also it is shown in drawing 13 , it omits the explanation.

[0114] Next, when an attention frame is what does not have a camera motion to the frame in front of one of them, the camera motion vector of an attention frame should become equal to the camera motion vector of the frame in front of one of them. However, as it mentioned above, when asking for the camera motion vector of a frame, when a motion of a foreground influences, even if there is no camera motion of an attention frame, a different thing from the camera motion vector of the frame in front of one of them may be found as the camera motion vector.

[0115] so, to the camera motion detecting element 12 shown in drawing 5 Form the motion-less judgment section 25 which judges whether an attention frame is what does not have a camera motion to the frame in front of one of them as a dotted line shows to this drawing, and it sets to the vector detecting element 22 further. In being a thing without a camera motion of an attention frame Output as a camera motion vector of an attention frame, and when an attention frame is a thing with a camera motion, the camera motion vector of the frame in front of one of them As it mentioned above, it can ask for the camera motion vector of an attention frame from the center of gravity of an attention frame and the motion detection range.

[0116] By doing in this way, when it is a thing without a camera motion of an attention frame, the camera motion vector of an attention frame can be made equal to the camera motion vector of the frame in front of one of them.

[0117] Then, with reference to the flow chart of drawing 15 , the processing (motion-less judgment processing) which judges whether it is the thing without a camera motion of an attention frame performed in the motion-less judgment section 25 is explained.

[0118] In motion-less judgment processing, step S71 of drawing 13 thru/or the respectively same processing as the case in S79 are performed in step S91 thru/or

S99.

[0119] And in step S99, when judged with an attention pixel being an edge pixel, it progresses to step S100 and it is judged whether it is equal to pixel value p' (x y) of the pixel which has the pixel value p of an attention pixel (x y) in the same location in front of one of them.

[0120] Here, p (x y) in step S100 shall include the case where p (x y) is [|p(x y)-p'(x y) |] less than a predetermined minute value when almost equal to p' (x y) as it is equal to p' (x y).

[0121] In step S100, when judged with it not being equal to pixel value p' (x y) of the pixel which has the pixel value p of an attention pixel (x y) in the same location in front of one of them, step S101 is skipped and it returns to step S96.

[0122] In step S100 moreover, the pixel value p of an attention pixel (x y) When judged with it being equal to pixel value p' (x y) of the pixel in the same location in front of one of them, That is, when equal to pixel value p' (x y) of the pixel before [one] the pixel value p of the attention pixel which is an edge pixel (x y) is in the same location spatially, it progresses to step S101, and the increment only of 1 is carried out and Variable c returns to step S96.

[0123] Here, Variable c is cleared by zero before motion-less judgment processing of drawing 15 is started.

[0124] Then, in step S94, when judged with Variable y not being under Y (i.e., when it processes by making into an attention pixel all the pixels that constitute an attention frame), it progresses to step S102 and it is judged whether Variable c is beyond the predetermined threshold th. When judged with Variable c being beyond the predetermined threshold th in step S102, Namely, the pixel used as a pixel value [being the same as that of the pixel which is in the edge pixel of an attention frame in the same location of one frame ago (almost the same)] When it exists beyond the threshold th, it progresses to step S103, and as a judgment result of whether an attention frame is what does not have a camera motion to the frame in front of one of them, the message of a purport without a motion is outputted to the vector detecting element 22, and ends motion-less judgment processing.

[0125] Moreover, when judged with Variable c not being beyond the predetermined threshold th in step S102, Namely, the pixel used as a pixel value [being the same as that of the pixel which is in the edge pixel of an attention frame in the same location of one frame ago (almost the same)] When it does not exist beyond the threshold th, progress to step S104 and an attention frame receives the frame in front of one of them. As a judgment result of whether it is a thing without a camera motion, the

message of a purport with a motion is outputted to the vector detecting element 22, and ends motion-less judgment processing.

[0126] In addition, motion-less judgment processing of drawing 15 is performed in advance of the processing which computes the center of gravity of the attention frame in the center-of-gravity calculation section 21, and the motion detection range, and is further performed for the frame after the 2nd frame.

[0127] Next, drawing 16 shows the example of a configuration of the background extract section 14 of drawing 2 .

[0128] The camera motion vector v1 of the 1st frame thru/or the Nth frame as a series of images memorized by the camera motion vector storage section 13 (drawing 2) thru/or vN are supplied to the existence range detecting element 31. The existence range detecting element 31 is in the condition which performed alignment of the background of the 1st thru/or the Nth frame, and detects the field (existence range) of the minimum rectangle where the 1st thru/or image of the Nth frame exists in standard coordinates.

[0129] That is, based on the camera motion vector v1 of the 1st frame thru/or the Nth frame thru/or vN, the existence range detecting element 31 is in the condition which performed the alignment about the 1st frame thru/or the Nth frame supposing the condition of having performed alignment of the background, and detects the existence range which is the field of the minimum rectangle where the 1st thru/or the pixel of the Nth frame exist. Furthermore, also in the standard coordinates of the existence range, the coordinate (Xmin, Ymin) of the top-most vertices of most the upper left and the coordinate (Xmax, Ymax) of the top-most vertices of most the lower right are searched for, and the existence range detecting element 31 is supplied to the read-out section 32 and the write-in section 35.

[0130] In addition, the condition of having performed alignment of the background of the 1st frame thru/or the Nth frame can be assumed in standard coordinates by arranging the 1st frame thru/or the Nth frame so that the top-most vertices at the upper left of a frame may be located in the coordinate shown by each camera motion vector v1 thru/or vN, as shown in drawing 17 .

[0131] The read-out section 32 detects and reads the pixel which is in the same location spatially, where alignment of the background of the 1st frame thru/or the Nth frame is performed among the pixels which constitute the 1st frame memorized by the are recording section 11 (drawing 2) thru/or the Nth frame, and it supplies it to the frequency count area 33 and the write-in section 35.

[0132] namely, — the read-out section 32 — the coordinate (Xmin, Ymin) from the

existence range detecting element 21 -- and (Xmax, Ymax) it being supplied and also The camera motion vector v1 memorized by the camera motion vector storage section 13 (drawing 2) thru/or vN are also supplied. The read-out section 32 First, based on the camera motion vector v1 of the 1st frame thru/or the Nth frame thru/or vN, the condition of having performed alignment of the background about the 1st frame thru/or the Nth frame is assumed like the existence range detecting element 31. Furthermore, the read-out section 32 carries out the sequential scan of the coordinate (Xmin, Ymin) supplied from the existence range detecting element 21 of standard coordinates, and (Xmax, Ymax) the coordinate of existence within the limits specified, and as shown in drawing 18 , it detects and reads the pixel of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background in each coordinate (x y).

[0133] In addition, detection of the pixel of the n-th frame located in the coordinate (x y) of standard coordinates in the condition of having performed alignment of the background of the 1st thru/or the Nth frame When the local system of coordinates (suitably henceforth local system of coordinates) which made the zero the pixel at the upper left of [the] the n-th frame are considered so to speak, it can carry out by detecting the pixel which is in the coordinate which subtracted the camera motion vector vn from a coordinate (x y).

[0134] The inside of the pixel to which the frequency count area 33 is supplied from the read-out section 32 and which constitutes the 1st thru/or the Nth frame, The pixel which is in the same location spatially where alignment of the background is performed every [of (calling it hereafter the same location pixel in an alignment condition suitably)] set -- for example, the frequency of the pixel belonging to each level of the pixel value mentioned above -- counting -- carrying out -- the counting -- based on a result, registration to the frequency table memorized by the frequency table storage section 34 of the latter part is performed.

[0135] The frequency table storage section 34 memorizes a frequency table as shown in drawing 19 . That is, the frequency table storage section 34 has memorized the frequency table for matching and registering each level of the pixel value of the same location pixel in an alignment condition, and the rate to the number of pixels of the same location pixel in the alignment condition of the frequency of the pixel belonging to the level about each coordinate (x y) of existence within the limits.

[0136] Here, in the set of the same location pixel in the alignment condition in a certain location (coordinate) of existence within the limits, the level of the large pixel value to the m-th of frequency is called m-th frequency level.

[0137] With the gestalt of operation of drawing 19 , M level and the rate of frequency from the 1st frequency level to the Mth frequency level are registered into a frequency table. therefore -- here -- the frequency count area 33 -- frequency -- the level 1st after M+-- counting of frequency -- a result is not registered into a frequency table but is canceled. however, counting of frequency -- a result can also be made to register with a frequency table about all level

[0138] In addition, as mentioned above, when the range of the value which can be taken as a pixel value is divided into K level, above-mentioned M becomes a value below K.

[0139] The write-in section 35 writes the background pixel which constitutes a whole background based on the frequency table memorized by the frequency table storage section 34 and the pixel supplied from the read-out section 32 in each address equivalent to existence within the limits supplied from the existence range detecting element 31 of the background memory 15 (drawing 2). Furthermore, the write-in section 35 also performs the writing of the background flag to the background flag memory 36.

[0140] The background flag memory 36 memorizes the background flag with which it expresses whether the background pixel is written in about each pixel of existence within the limits. That is, the write-in section 35 writes a background flag in the address of the background flag memory 36 corresponding to the address, when a background pixel is written in the address with the background memory 15. Here, a background flag shall presuppose that it is a 1-bit flag, the background flag corresponding to the address with which the background pixel is written in shall be set to 1, and the background flag corresponding to the address which is not written in yet shall be set to 0.

[0141] Next, with reference to the flow chart of drawing 20 , background extract processing in which a whole background is extracted is explained from the 1st frame performed in the background extract section 14 of drawing 16 thru/or the Nth frame.

[0142] First, in step S111, as the existence range detecting element 31 reads a camera motion vector from the camera motion vector storage section 13 and explained it by drawing 17 , it detects the existence range. And the coordinate (Xmin, Ymin) of the point of the upper left in the standard coordinates of the existence range and the coordinate (Xmax, Ymax) of a lower right point are supplied to the read-out section 32 and the write-in section 35 as information for pinpointing the existence range.

[0143] Ymin-1 as initial value is set to the coordinate (Xmin, Ymin) for pinpointing the

existence range, and (Xmax, Ymax) the variable y for scanning the existence range to y shaft orientations of standard coordinates in step S112, if it receives, it progresses to step S113, only 1 increments the variable y, and the read-out section 31 progresses to step S114. At step S114, when judged with it being judged whether Variable y is below Ymax and being below Ymax, it progresses to step S115. At step S115, the read-out section 31 sets Xmin-1 as initial value to the variable x for scanning the existence range in the direction of a x axis of standard coordinates, progresses to step S116, and only 1 increments the variable x and it progresses to step S117. At step S117, when judged with it being judged whether Variable x is below Xmax and not being below Xmax, the same processing is repeated by step S113 return and the following.

[0144] Moreover, in step S117, when judged with Variable x being below Xmax, it progresses to step S118, and 0 as initial value is set to the variable n for counting the frame number of the 1st frame thru/or the Nth frame as a series of images memorized by the are recording section 11 (drawing 2), and it progresses to step S119. At step S119, it is judged whether Variable n is below N that is the frame number of a series of images with which the increment only of 1 was carried out, it progressed to step S120, and Variable n was memorized by the are recording section 11 (drawing 2).

[0145] In step S120, when judged with Variable n being below N, it progresses to step S121, and where alignment of the background of the 1st frame thru/or the Nth frame is performed, in the read-out section 32, reading appearance of the pixel of the n-th frame in the location of the coordinate (x y) of standard coordinates is carried out from the are recording section 11 (drawing 2). That is, the read-out section 32 is the coordinate (x y) which subtracted the camera motion vector vn from the coordinate (x y) in the local system of coordinates which made the zero the pixel at the upper left of the n-th frame. - The pixel in vn is read from the are recording section 11 (drawing 2).

[0146] In addition, while expressing the x-coordinate or y-coordinate of the camera motion vector vn as xv#n or yv#n, respectively If the side of one frame or the vertical number of pixels is expressing X or Y, respectively, although the read-out section 32 will read the pixel located in the coordinate (x-xv#n, y-yv#n) in the local system of coordinates about the n-th frame In this case, the pixel of the n-th frame does not exist in the coordinate (x-xv#n, y-yv#n) of 0 <=x-xv#n<X and 0 <=y-yv#n<Y which can be set out of range. Therefore, read-out of the pixel of the n-th frame in step S121 is performed, only when x-xv#n is within the limits of 0 <=x-xv#n<X and y-yv#n is within the limits of 0 <=y-yv#n<Y.

[0147] In step S121, if the pixel of the n-th frame is read, the read-out section 32 will

supply the pixel to the frequency count area 33 and the write-in section 35, and will return from the are recording section 11 (drawing 2) to step S119. And until it is judged with Variable n not being below N in step S120 Step S119 thru/or processing of S121 are repeated, and by this, where alignment of the background of the 1st frame thru/or the Nth frame is performed The pixel (the same location pixel in an alignment condition) of the 1st frame in the location of the coordinate (x y) of standard coordinates thru/or the Nth frame is supplied to the frequency count area 33 and the write-in section 35. However, as mentioned above, depending on a frame, a pixel may not exist in the coordinate (x y) of standard coordinates, and the pixel of that frame is not contained in the pixel supplied to the frequency count area 33 and the write-in section 35 in this case.

[0148] If judged with Variable n not being below N in step S120, it will progress to step S122. Then, the frequency count area 33 The pixel value carries out the level classification of each pixel of the 1st thru/or the Nth frame in the condition of having performed alignment of a background in the location of the coordinate (x y) of standard coordinates supplied from the read-out section 32 by whether it belongs to level 1 thru/or which range of the K. Furthermore, the frequency count area 33 carries out counting of the frequency of the pixel belonging to each level, and asks for the rate (rate to the total of the pixel belonging to each level) of the frequency.

[0149] And it progresses to step S123, and the frequency count area 33 is registered into the column (line) of a coordinate (x y) in a frequency table as showed the rate of the frequency of a pixel that the rate of frequency belongs to the level (the 1st frequency level thru/or the Mth frequency level) and each of its level from the 1st place to the Mth place to drawing 19 of the frequency table storage section 34, and returns to step S116.

[0150] When it is judged with Variable y not being below Ymax in step S114 on the other hand, When all the coordinates of existence within the limits are processed, it progresses to step S124. Namely, the write-in section 35 The coordinate which the rate of the pixel belonging to the 1st frequency level has become in the frequency table memorized by the frequency table storage section 34 beyond the predetermined value is detected. Background pixel extract processing which writes in the pixel value corresponding to the 1st frequency level as a pixel value of a background pixel is performed to the address of the background memory 15 corresponding to the coordinate, and it goes to it at step S125. At step S125, about the coordinate of existence within the limits in which a pixel value was not written in background pixel extract processing of step S124, the write-in section 35 performs background escape

processing which writes in the pixel value as a background pixel, and ends background extract processing.

[0151] Next, with reference to the flow chart of drawing 21 , the background pixel extract processing which writes in in step S124 of drawing 20 , and the section 35 performs is explained.

[0152] In background pixel extract processing, in step S131 thru/or S136, step S112 of drawing 20 thru/or the respectively same processing as the case in 117 are performed, and it sets to step S136. When judged with Variable x being below Xmax, it is judged by progressing to step S37 and referring to a frequency table whether the rate of the 1st frequency level to a coordinate (x y) is beyond the predetermined threshold Lth.

[0153] When judged with the rate of the 1st frequency level to a coordinate (x y) not being beyond the predetermined threshold Lth in step S137, That is, when the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) among the pixels which constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame is not high, steps S138 and S139 are skipped, and it returns to step S135.

[0154] Therefore, the pixel value of a background pixel is not written in the address of the background memory 15 (drawing 2) corresponding to the coordinate (x y) in the existence range in this case.

[0155] When it is judged with the rate of the 1st frequency level to a coordinate (x y) being beyond the predetermined threshold Lth in step S137 on the other hand, Namely, the inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame, When the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) is high, it progresses to step S138 and the write-in section 35 writes a pixel value with the high rate of the frequency in the background memory 15 as a pixel value of the background pixel located in a coordinate (x y).

[0156] That is, the write-in section 35 extracts what belongs to the 1st frequency level among the pixels located in the coordinate (x y) of the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame from the pixel supplied from the read-out section 32, for example, calculates the average. And the write-in section 35 writes the average in the background memory 15 as a pixel value of the background pixel located in a coordinate (x y).

[0157] After processing of step S138, it progresses to step S139, the write-in section 35 sets to 1 the background flag memorized to the address corresponding to the

coordinate (x y) of the background flag memory 36 (leave a background flag), and the same processing is repeated until it is judged with Variable y not being below Ymax by step S135 in step S133 return and the following.

[0158] And in step S133, if judged with Variable y not being below Ymax, a return will be carried out.

[0159] Here, the storage value of the background flag memory 36 is cleared by 0 when background pixel extract processing of drawing 21 is started.

[0160] Next, in background pixel extract processing in which it explained by drawing 21 , as mentioned above, when the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) among the pixels which constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame is not high, the pixel value as a background is not written in a coordinate (x y).

[0161] Namely, the inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame from background pixel extract processing, When the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) is high, it is written in the background memory 15 as a thing with most pixel values of the frequency probable as a pixel value of the whole background in a coordinate (x y). therefore, when most pixel values of frequency cannot say that it is probable as a pixel value of the whole background in a coordinate (x y), here The inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame, When the rate of the frequency of the pixel value with most frequency of the pixel located in a coordinate (x y) is not high, in background pixel extract processing, the pixel value of a whole background is not written in the address of the background memory 15 corresponding to a coordinate (x y).

[0162] Consequently, by background pixel extract processing, so to speak, the whole background which consists of that a pixel value is written in the background memory 15 is in the vermin condition, and needs to bury the vermin part. For this reason, in background extract processing of drawing 20 , after background pixel extract processing (drawing 21) is performed at step S124, in step S125, background escape processing which extends the background so to speak is performed by fill uping a vermin part with a pixel value.

[0163] Then, with reference to the flow chart of drawing 22 , the background escape processing in step S125 of drawing 20 is explained.

[0164] In background escape processing, in step S141, Ymin−1 as initial value is set to

Variable y, and it progresses to step S142, and the increment only of 1 is carried out and the variable y progresses to step S143. At step S143, when judged with it being judged whether Variable y is below Ymax and being below Ymax, it progresses to step S145. At step S145, Xmin−1 as initial value is set to Variable x, and it progresses to step S146, and the increment only of 1 is carried out and the variable x progresses to step S147. At step S147, when judged with it being judged whether Variable x is below Xmax and not being below Xmax, the same processing is repeated by step S142 return and the following.

[0165] Moreover, in step S147, when judged with Variable x being below Xmax, it progresses to step S148 and it is judged whether the background flag memorized to the address of the background flag memory 36 corresponding to a coordinate (x y) is 0. When judged with the background flag memorized to the address of the background flag memory 36 corresponding to a coordinate (x y) not being 0 in step S148, That is, the background flag is 1, therefore when the pixel value as a whole background is already written in the address of the background memory 15 (drawing 2) corresponding to a coordinate (x y), the same processing is repeated by step S146 return and the following.

[0166] Moreover, when judged with the background flag memorized to the address of the background flag memory 36 corresponding to a coordinate (x y) being 0 in step S148, To namely, the address of the background memory 15 (drawing 2) corresponding to a coordinate (x y) When the pixel value as a whole background is not written in, it still progresses to step S149. Moreover as a surrounding pixel of the pixel located in a coordinate (x y), the bottom, it is judged because whether the background flag about either of the pixels which adjoin the left, the right, the upper left, the lower left, the upper right, and the lower right is 1 refers to the background flag memory 36.

[0167] When judged with neither of the background flags of the pixel which adjoins the pixel located in a coordinate (x y) in step S149 being 1, Namely, a coordinate (x y−1), (x, y+1), (x−1, y), (x+1, y), When the pixel value as a whole background is written in neither of the address of the background memory 15 (drawing 2) corresponding to (x−1, y−1), (x−1, y+1), (x+1, y−1), and each (x+1, y+1) yet, it returns to step S146.

[0168] Moreover, when judged with one background flag of the pixels which adjoin the pixel located in a coordinate (x y) in step S149 being 1, Namely, a coordinate (x y−1), (x, y+1), (x−1, y), (x+1, y), When the pixel value as a whole background is already written in either of the addresses of the background memory 15 (drawing 2) corresponding to (x−1, y−1), (x−1, y+1), (x+1, y−1), and each (x+1, y+1), it progresses to step S150.

[0169] Here, that in which the pixel value as a whole background is written among the

pixels (address of the corresponding background memory 15 (drawing 2)) which adjoin the pixel located in a coordinate (x y) is hereafter called written in contiguity pixel suitably.

[0170] At step S150, it is judged whether the level of the pixel value of a written in contiguity pixel and a continuous pixel value is registered into the frequency table as either the 1st to a coordinate (x y) or thru/or the Mth frequency level. Here, a continuous pixel value means pixel values (the same pixel value is included) with a near value.

[0171] In step S150, the level of the pixel value of a written in contiguity pixel and a continuous pixel value as either the 1st to a coordinate (x y) or thru/or the Mth frequency level When judged with registering with the frequency table, constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame. What has the pixel value which follows the pixel value of a written in contiguity pixel in the pixel located in a coordinate (x y) the case where it exists more than a certain amount of rate -- step S151 -- progressing -- the -- Based on the pixel value which exists more than a certain amount of rate and which follows the pixel value of a written in contiguity pixel, the pixel value as a whole pixel background located in a coordinate (x y) is computed, and it is written in the address with which the background memory 15 (drawing 2) corresponds.

[0172] Namely, supposing the level of the pixel value of a written in contiguity pixel and a continuous pixel value was registered into the frequency table as the m-th frequency level of the 1st to a coordinate (x y) thru/or the Mth frequency level Constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame from a step S151. The average of the pixel value belonging to the m-th frequency level of the pixels located in a coordinate (x y) is computed, and the average is written in the address with which the background memory 15 (drawing 2) corresponds as a pixel value as a whole pixel background located in a coordinate (x y).

[0173] As mentioned above, here in background pixel extract processing The inside of the pixel which constitutes the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame, Although it is written in the background memory 15 as a thing with most pixel values of the frequency probable as a pixel value of the whole background in a coordinate (x y) when the rate of the frequency of the pixel value with most frequency located in a coordinate (x y) is high For example, a certain scenery is made into a background. according to this background pixel extract processing When a series of images which become with the

N frame which a certain body moves as a foreground are considered Since the rate of the frequency of the pixel value currently continued and displayed on almost all the frames about the pixel as which most N frames are covered and the background is displayed becomes high, without being hidden by the foreground, the pixel value is written in as a pixel value of a background.

[0174] However, the pixel (suitably henceforth a medium pixel) as which a foreground is displayed when a foreground moves, or a background is displayed Since it becomes the pixel value which constitutes a foreground or becomes the pixel value which constitutes a background, since the pixel value to which the rate of frequency becomes high does not exist, about a medium pixel, the writing of a pixel value is not performed by background pixel extract processing.

[0175] Although what is necessary is just to write in the pixel value of the frame as which the background is displayed there about a medium pixel in order to acquire a whole background, it is difficult to specify the frame as which the background is displayed on the medium pixel. Then, if there are some in which the pixel value as a whole background is already written and the pixel value and a near pixel value may be displayed as a pixel value of a medium pixel in background escape processing into the pixel which adjoins a medium pixel It is written in the background memory 15 (drawing 2) noting that a pixel value with the thing [having been displayed] is probable as a pixel value when a background is displayed on a medium pixel.

[0176] Therefore, according to background escape processing, it becomes possible to write in the pixel value of the background extremely displayed in one of them only in one certain frame also about the pixel (medium pixel) as which the background was displayed.

[0177] On the other hand in step S150, the level of the pixel value of a written in contiguity pixel and a continuous pixel value as either the 1st to a coordinate (x y) or thru/or the Mth frequency level When judged with not registering with a frequency table, constitute the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame. When what has the pixel value which follows the pixel value of a written in contiguity pixel does not exist in the pixel located in a coordinate (x y), It progresses to step S152, the pixel value as a whole pixel background located in a coordinate (x y) is computed based on the pixel value of a written in contiguity pixel, and it is written in the address with which the background memory 15 (drawing 2) corresponds.

[0178] Namely, although some (written in contiguity pixel) in which the pixel value as a whole background is already written are in the pixel which adjoins a medium pixel

When the pixel value and a near pixel value are not displayed as a pixel value of a medium pixel In step S152, the pixel value (for example, the average when two or more written in contiguity pixels exist) of a written in contiguity pixel is written in the background memory 15 (drawing 2) as a pixel value as a whole pixel background located in a coordinate (x y).

[0179] After processing of steps S151 and S152, it progresses to step S153, the background flag of the address corresponding to the coordinate (x y) of the background flag 36 of a pixel with which the pixel value as a whole background was written in at steps S151 or S152, i.e., background flag memory, is set to 1 by each (built), and the same processing is repeated by step S146 return and the following.

[0180] On the other hand, when judged with Variable y not being below Ymax in step S143, it is judged whether all the background flags to each coordinate of existence within the limits which progressed to step S144 and was memorized by the foreground flag memory 36 are 1. In step S143, when judged with some which are not 1 being in the background flag corresponding to each coordinate of existence within the limits (i.e., when some in which the pixel value as a whole background is not written yet are in the pixel located in the coordinate of existence within the limits), the same processing is repeated by step S141 return and the following.

[0181] Moreover, in step S144, when judged with there being nothing that is not 1 into the background flag corresponding to each coordinate of existence within the limits (i.e., when the pixel value as a whole background is written in all the pixels located at the coordinate of existence within the limits), a return is carried out.

[0182] The pixel in which according to the processing explained by drawing 22 the pixel value as a whole background was already written as shown in drawing 23 (in this drawing) - When the pixel P (x y) (O mark which attached the slash shows this drawing) which adjoins that the mark shows and in which the pixel value is not written yet exists The written in contiguity pixel which adjoins the pixel P (x y) (in this drawing) The pixel value of Pixels P (x-1, y), P (x-1, y-1), P (x y-1), and P (x+1, y+1), the pixel value, the pixel value which has a continuity, etc. are written in as a pixel value as a whole pixel P (x y) background, and, thereby, the whole background is extended. From this, processing of drawing 22 is called background escape processing.

[0183] Next, drawing 24 shows the example of a configuration of the foreground coding section 16 of drawing 2 .

[0184] The 1st frame as a series of images memorized by the are recording section 11 (drawing 2) thru/or the Nth frame, the whole background memorized by the background memory 15 (drawing 2), and the camera motion vector memorized by the

camera motion vector storage section 13 (drawing 2) are supplied to the foreground extract section 41, and the foreground extract section 41 extracts a foreground from the 1st frame thru/or each Nth frame. That is, it is arranging the n-th frame, and the foreground extract section 41 performs alignment of a whole background and the n-th frame, it is subtracting the pixel of the whole background in the same location from each pixel of the n-th frame, and extracts a foreground from the n-th frame so that the point at the upper left of the n-th frame may be located in the location where only the camera motion vector vn shifted in the standard coordinates of a whole background.

[0185] The foreground storage section 42 memorizes the 1st thru/or the foreground of the Nth frame which the foreground extract section 41 extracted.

[0186] The camera motion vector memorized by the camera motion vector storage section 13 (drawing 2) is supplied to the foreground are recording image configuration section 43, and the foreground are recording image configuration section 43 constitutes a front are recording image and a back are recording image using the foreground of the 1st frame thru/or the Nth frame memorized by the foreground storage section 42 based on the camera motion vector. Namely, the foreground are recording image configuration section 43 is based on a camera motion vector, as shown in drawing 25 . The foreground of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background is assumed. The back are recording image obtained when the foreground of the 1st frame thru/or the Nth frame is seen toward the travelling direction of time amount (image constituted by the foreground at which it looked from the past), The front are recording image (image constituted by the foreground at which it looked from the future) obtained when it goes to the travelling direction and hard flow of time amount is constituted.

[0187] In addition, a front are recording image is the sequence of the 1st frame to the Nth frame, and can acquire the pixel value of the foreground of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background, by overwriting memory etc. Similarly, a back are recording image is the sequence of the Nth frame to the 1st frame, and can acquire the pixel value of the foreground of the 1st frame thru/or the Nth frame in the condition of having performed alignment of a background, by overwriting memory etc.

[0188] The foreground are recording image storage section 44 memorizes the front are recording image and back are recording image which were constituted in the foreground are recording image configuration section 43.

[0189] The study section 45 performs study processing which asks for the prediction

coefficient for predicting the pixel which constitutes the foreground of the 1st frame thru/or each Nth frame from the pixel which constitutes the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, and the error image which was further memorized by the error image storage section 49 if needed, and which is mentioned later.

[0190] The prediction coefficient storage section 46 memorizes the prediction coefficient called for by performing study in the study section 45.

[0191] The adaptation processing section 47 performs adaptation processing which predicts the foreground of the 1st frame thru/or each Nth frame using the pixel which constitutes the front are recording image and back are recording image which were memorized by the foreground are recording image storage section 44, the prediction coefficient memorized by the prediction coefficient storage section 46, and the error image further memorized by the error image storage section 49 if needed.

[0192] Here, the study processing performed in the study section 45 and the adaptation processing performed in the adaptation processing section 47 are explained.

[0193] The forecast of the pixel which constitutes the image (here a front are recording image and a back are recording image, and an error image) which exists now from adaptation processing, for example, and the pixel which constitutes a desired image (here foreground of the 1st frame thru/or each Nth frame) by linear combination with a predetermined prediction coefficient is calculated.

[0194] On the other hand, by study processing, while using a desired image (suitably henceforth a request image) as educator data The image (suitably henceforth an existence image) which exists when it is going to ask for the request image is used as student data. Forecast [of the pixel value y of the pixel (suitably henceforth a request pixel) which constitutes a request image] E [y] For example, the pixel value x1 of a some existence pixel (pixel which constitutes an existence image), x2, and the set of ..., The prediction coefficient for asking with the primary linearity joint model specified by the predetermined prediction coefficients w1 and w2 and the linear combination of ... is called for. In this case, forecast E [y] can be expressed with a degree type.

[0195]

E [y] =w1x1+w2x2+ ...... (1)

[0196] It is [Equation 1] about matrix Y' which becomes by the matrix X which becomes by the matrix W which becomes by the set of a prediction coefficient wj, and the student data aggregate in order to generalize a formula (1), and the set of forecast E [y].

$$X=\begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1J} \\ x_{21} & x_{22} & \cdots & x_{2J} \\ \cdots & \cdots & \cdots & x_{1J} \\ x_{I1} & x_{I2} & \cdots & x_{IJ} \end{bmatrix}$$

$$W=\begin{bmatrix} w_1 \\ w_2 \\ \cdots \\ w_J \end{bmatrix},\ Y'=\begin{bmatrix} E[y_1] \\ E[y_2] \\ \cdots \\ E[y_I] \end{bmatrix}$$

If a definition is come out and given, the following observation equations will be materialized.

[0197] XW=Y' ... (2)

Here, the component xij of Matrix X means the j-th student data in the student data aggregate (student data aggregate used for prediction of the educator data yi of the i-th affair) of the i-th affair, and the component wj of Matrix W expresses the prediction coefficient which a product with the j-th student data in the student data aggregate calculates. Moreover, yi expresses the educator data of the i-th affair, therefore E [yi] expresses the forecast of the educator data of the i-th affair. In addition, y in the left part of a formula (1) omits the suffix i of the component yi of Matrix Y, and x1 in the right-hand side of a formula (1), x2, and ... also omit the suffix i of the component xij of Matrix X.

[0198] And it considers applying a least square method to this observation equation, and asking for forecast E [y] near the pixel value y of a request pixel. In this case, it is [Equation 2] about the matrix E which becomes by the set of the matrix Y which becomes by the set of the true pixel value y of the request pixel used as educator data, and the remainder e of forecast E [y] to the pixel value y of a request pixel.

$$E=\begin{bmatrix} e_1 \\ e_2 \\ \cdots \\ e_I \end{bmatrix},\ Y=\begin{bmatrix} y_1 \\ y_2 \\ \cdots \\ y_I \end{bmatrix}$$

If a definition is come out and given, the following remainder equations will be materialized from an equation (2).

[0199] XW=Y+E ... (3)

[0200] In this case, the prediction coefficient wj for asking for forecast E [y] near the pixel value y of a request pixel is a square error [several 3].

It can ask by making it min.

[0201] Therefore, it will be called an optimum value, when what differentiated the above-mentioned square error with the prediction coefficient wj is set to 0, namely, in order that the prediction coefficient wj which fills a degree type may ask for forecast E [y] near the pixel value y of a request pixel.

[0202]

[Equation 4]

$$e_1 \frac{\partial e_1}{\partial w_j} + e_2 \frac{\partial e_2}{\partial w_j} + \cdots + e_I \frac{\partial e_I}{\partial w_j} = 0 \quad (j = 1, 2, \cdots, J)$$

... (4)

[0203] Then, a degree type is first materialized by differentiating a formula (3) with a prediction coefficient wj.

[0204]

[Equation 5]

$$\frac{\partial e_i}{\partial w_1} = x_{i1}, \quad \frac{\partial e_i}{\partial w_2} = x_{i2}, \cdots, \quad \frac{\partial e_i}{\partial w_J} = x_{iJ}, \quad (i = 1, 2, \cdots, I)$$

... (5)

[0205] A formula (6) is obtained from a formula (4) and (5).

[0206]

[Equation 6]

$$\sum_{i=1}^{I} e_i x_{i1} = 0, \sum_{i=1}^{I} e_i x_{i2} = 0, \sum_{i=1}^{I} \cdots e_i x_{iJ} = 0$$

... (6)

[0207] Furthermore, if the relation of the student data xij in the remainder equation of an equation (3), a prediction coefficient wj, the educator data yi, and Remainder ei is taken into consideration, the following normal equations can be obtained from an equation (6).

[0208]

[Equation 7]

$$\begin{cases} (\sum_{i=1}^{I} x_{i1}x_{i1})w_1+(\sum_{i=1}^{I} x_{i1}x_{i2})w_2+\cdots+(\sum_{i=1}^{I} x_{i1}x_{iJ})w_J=(\sum_{i=1}^{I} x_{i1}y_i) \\ (\sum_{i=1}^{I} x_{i2}x_{i1})w_1+(\sum_{i=1}^{I} x_{i2}x_{i2})w_2+\cdots+(\sum_{i=1}^{I} x_{i2}x_{iJ})w_J=(\sum_{i=1}^{I} x_{i2}y_i) \\ \cdots \\ (\sum_{i=1}^{I} x_{iJ}x_{i1})w_1+(\sum_{i=1}^{I} x_{iJ}x_{i2})w_2+\cdots+(\sum_{i=1}^{I} x_{iJ}x_{iJ})w_J=(\sum_{i=1}^{I} x_{iJ}y_i) \end{cases}$$

... (7)

[0209] Each equation which constitutes the normal equation of an equation (7) is that only a certain amount of number prepares the set of the student data xij and the educator data yi. Only the same number as several J of the prediction coefficient wj for which it should ask can be built, therefore a formula (7) can be asked for the optimal prediction coefficient wj by solution Lycium chinense (however, in order to solve a formula (7), in a formula (7), the matrix which consists of multipliers concerning a prediction coefficient wj needs to be regular). In addition, in solving a formula (7), it is possible to sweep out and to, use law (method of elimination of Gauss-Jordan) etc. for example.

[0210] Study processing asks for the optimal prediction coefficient wj as mentioned above, and adaptation processing asks for forecast E [y] near the pixel value y of a request pixel by the formula (1) using the prediction coefficient wj.

[0211] That is, in the study section 45 or the adaptation processing section 47, while using as an existence image the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, and the error image further memorized by the error image storage section 49 if needed, study processing or adaptation processing is performed, respectively considering the foreground of the 1st frame thru/or each Nth frame as a request image.

[0212] In addition, although adaptation processing is not included in an existence image, it is the point that the component contained in a request image is reproduced, for example, differs from mere interpolation processing. That is, in adaptation processing, as long as a formula (1) is seen, it is the same as that of the interpolation processing using the so-called interpolation filter, but since [for which the prediction coefficient w equivalent to the tap multiplier of the interpolation filter uses the educator data y] it asks by study so to speak, the component contained in a request image is reproducible. From this, adaptation processing can be called processing

which, so to speak, has a creation (resolution imagination) operation of an image.

[0213] The error count section 48 reads the foreground of the 1st frame thru/or each Nth frame from the foreground storage section 42, and calculates the prediction error of the forecast of the foreground of the 1st frame thru/or each Nth frame called for in the adaptation processing section 47. Namely, the error count section 48 calculates a prediction error for every pixel by subtracting the true value of the pixel value of the pixel from the forecast of the pixel which constitutes the foreground of the n-th frame.

[0214] The error image storage section 49 memorizes the image (suitably henceforth an error image) which becomes by the prediction error of the foreground of the 1st frame thru/or the Nth frame called for in the error count section 48.

[0215] The error judging section 50 calculates for example, the absolute value sum of the prediction error as a pixel value of each pixel which constitutes the error image memorized by the error image storage section 49, and judges whether the absolute value sum has become below a predetermined threshold (following).

[0216] MUX (multiplexer)51 is based on the judgment result by the error judging section 50. To the prediction coefficient and pan which were memorized by the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, and the prediction coefficient storage section 46 The error image memorized by the error image storage section 49 is multiplexed if needed, and the multiplexing data obtained as a result are outputted to a multiplexer 17 (drawing 2) as a coding result of the foreground of the 1st frame thru/or each Nth frame.

[0217] Next, drawing 26 shows the example of a configuration of the study section 45 of drawing 24 .

[0218] The front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image (suitably henceforth [both are included and] a foreground are recording image), and the error image further memorized by the error image storage section 49 if needed are supplied to the prediction tap configuration section 61. And the prediction tap configuration section 61 sets as an attention pixel what is going to calculate a forecast among the pixels which constitute the foreground of the 1st frame thru/or each Nth frame in the condition of having performed alignment of a background to standard coordinates. The pixel of the front are recording image in the location near an attention pixel and a space target and a back are recording image and the pixel of an error image are extracted, and it outputs to the normal equation configuration section 62 as a prediction tap used for calculating the forecast of an attention pixel by adaptation

processing.

[0219] A prediction tap is supplied from the prediction tap configuration section 61, and also the pixel which constitutes the foreground of the 1st frame memorized by the foreground storage section 42 thru/or each Nth frame is supplied to the normal equation configuration section 62. And the normal-equation configuration section 62 performs the add lump for the pixel (educator data) and prediction tap (student data) of the foreground used as an attention pixel.

[0220] That is, the normal equation configuration section 62 performs the multiplication (xijxi'j') of the student data (prediction tap) used as the multiplier of a prediction coefficient in the left part of the normal equation of an equation (7), and the operation equivalent to a summation (sigma) using a prediction tap.

[0221] Furthermore, the normal equation configuration section 62 performs the multiplication (xijyj) of the student data (prediction tap) in the right-hand side of the normal equation of an equation (7), and educator data (attention pixel), and the operation equivalent to a summation (sigma) using a prediction tap and an attention pixel.

[0222] The normal equation having held as an attention pixel and having shown by this the pixel from which the above processing constitutes the foreground of the 1st frame thru/or each Nth frame at a ceremony (7) is built in the normal equation configuration section 62.

[0223] And the prediction coefficient calculation section 63 asks for a prediction coefficient, and makes the prediction coefficient storage section 46 (drawing 24) supply and memorize after that the normal equation generated in the normal equation configuration section 62 by solution Lycium chinense.

[0224] Here, with the gestalt of this operation, forecast [of the pixel value An (x y) of the pixel which is in the location (x y) of n-th-frame standard coordinates' existence within the limits among the 1st frame in the condition of having performed alignment of a background thru/or the Nth frame] E [An (x y)] is called for in the adaptation processing section 47 of drawing 24 for example, according to a degree type.

[0225]

E[An(x,y)]=g(F,B,E,n)

... (8)

Here, in a formula (8), F, B, and E express a front are recording image, a back are recording image, and an error image, respectively, and Function g (F, B, E, n) is defined by the degree type equivalent to the linearity linear expression of a formula (1).

[0226]

g(F, B, E, n) =wF1xf1+wF2xf2+ ... + wB1xb1+wB2xb2+ ... + wE1xe1+wE2xe2+ ... +wxn ... (9)

Here, in a formula (9), wF1, wF2, ..., wB1 and wB2, ..., wE1, wE2, ..., w express a prediction coefficient. Moreover, the pixel which constitutes the prediction tap about an attention pixel among the pixels from which e1, e2, and ... constitute the error image E for the pixel which constitutes the prediction tap about an attention pixel among the pixels from which b1, b2, and ... constitute the back are-recording image B for the pixel which constitutes the prediction tap about an attention pixel among the pixels from which f1, f2, and ... constitute the front are recording image F is expressed, respectively.

[0227] When Function g (F, B, E, n) is defined by the equation (9), in the normal equation configuration section 62 of drawing 26 The normal equation for asking for the prediction coefficients wF1 and wF2 in an equation (9), ..., wB1 and wB2, ..., wE1, wE2, ..., w is built. In the prediction coefficient calculation section 63 Prediction coefficients wF1 and wF2, ..., wB1 and wB2, ..., wE1, wE2, ..., w are asked for the normal equation by solution Lycium chinense. Therefore, the prediction coefficients wF1 and wF2 of one set, ..., wB1 and wB2, ..., wE1, wE2, ..., w are called for about the foreground of the 1st frame thru/or all the Nth frame in this case.

[0228] Next, drawing 27 shows the example of a configuration of the adaptation processing section 47 of drawing 24 .

[0229] The foreground are recording image memorized by the foreground are recording image storage section 44 and the error image further memorized by the error image storage section 49 if needed are supplied to the prediction tap configuration section 71. and the prediction tap configuration section 71 like the case in the prediction tap configuration section 61 of drawing 26 What is going to calculate a forecast among the pixels which constitute the foreground of the 1st frame thru/or each Nth frame in the condition of having performed alignment of a background is set to standard coordinates as an attention pixel. The pixel of the front are recording image in the location near an attention pixel and a space target and a back are recording image and the pixel of an error image are extracted, and it outputs to the prediction operation part 72 as a prediction tap.

[0230] A prediction tap is supplied from the prediction tap configuration section 71, and also the prediction coefficient memorized by the prediction coefficient storage section 46 (drawing 24) is supplied to the prediction operation part 72. And in the prediction operation part 72, the forecast of the pixel of a foreground used as an attention pixel is calculated by calculating the linearity linear expression defined by a

formula (8) and (9) using a prediction tap and a prediction coefficient, and is outputted to the error count section 48.

[0231] Next, with reference to the flow chart of drawing 28 , the foreground coding processing which encodes the foreground of the 1st frame thru/or each Nth frame performed in the foreground coding section 16 of drawing 24 is explained.

[0232] It sets to step S161 first. The foreground extract section 41 The camera motion vector memorized by the camera motion vector storage section 13 (drawing 2), And as it mentioned above, a foreground is extracted, and the foreground storage section 42 is supplied and is made to memorize using the whole background memorized by the background memory 15 (drawing 2) from each image of the 1st frame thru/or the Nth frame memorized by the are recording section 11 (drawing 2).

[0233] And it progresses to step S162, and the foreground are recording image configuration section 43 constitutes a front are recording image and a back are recording image which were explained by drawing 25 from a foreground of the 1st frame memorized by the foreground storage section 42 thru/or each Nth frame, and the foreground are recording image storage section 44 is made to supply and memorize it, and it progresses to step 163.

[0234] At step S163, study is performed using the pixel which constitutes the front are recording image memorized by the foreground are recording image storage section 44 in the study section 45 and a back are recording image, and the error image further memorized by the error image storage section 49 if needed, and, thereby, the prediction coefficient for predicting the pixel which constitutes the foreground of the 1st frame thru/or each Nth frame is called for.

[0235] Here, when study processing is first performed at step S163, since the error image is not memorized by the error image storage section 49, study is still performed in it, without using an error image (it being unable to use).

[0236] The prediction coefficient obtained as a result of the study in step S163 is supplied to the prediction coefficient storage section 46 from the study section 45, and is memorized in the form to overwrite. If a prediction coefficient is memorized by the prediction coefficient storage section 46, it will set to step S164. The adaptation processing section 47 To the pixel which constitutes the front are recording image and back are recording image which were memorized by the foreground are recording image storage section 44, the prediction coefficient memorized by the prediction coefficient storage section 46, and a pan Adaptation processing which calculates the forecast of each pixel which constitutes the foreground of the 1st frame thru/or each Nth frame is performed by calculating a formula (8) and the linearity linear expression

of (9) using the error image memorized by the error image storage section 49 if needed.

[0237] Here, when adaptation processing is first performed at step S164, since the error image is not memorized by the error image storage section 49, adaptation processing is still performed in it, without using an error image (it being unable to use).

[0238] The forecast of each pixel which constitutes the foreground of the 1st frame obtained as a result of the adaptation processing in step S164 thru/or each Nth frame is supplied to the error count section 48, in the error count section 48, in step S165, it is referring to the foreground of the 1st frame memorized by the foreground storage section 42 thru/or each Nth frame, and the prediction error of the forecast of each pixel which constitutes the foreground is searched for.

[0239] And it progresses to step S166, and about each location of standard coordinates' existence within the limits, the absolute value of the prediction error in the location extracts the pixel which is max from the pixel which constitutes the foreground of the 1st frame thru/or each Nth frame, and supplies the error count section 48 to the error image storage section 49 by using the image which becomes by the prediction error of the extracted pixel as an error image. In the error image storage section 49, the error image from the error count section 48 is memorized.

[0240] Then, it progresses to step S167, total of the absolute value of the pixel value (prediction error) of each pixel which constitutes the error image memorized by the error image storage section 49 in the error judging section 50 is called for, and it is judged whether the total is below a predetermined threshold (following).

[0241] In step S167, when it judges that total of the absolute value of the pixel value (prediction error) of each pixel which constitutes an error image is not below a predetermined threshold (i.e., when the precision of the forecast of the foreground obtained from a prediction coefficient, and a front are recording image and a back are recording image (the need is accepted and it is an error image further) is not high), the same processing is repeated by step S163 return and the following.

[0242] In addition, at next steps S163 or S164, since the error image is memorized by the error image storage section 49 in this case, as shown in drawing 29 , an error image besides a front are recording image and a back are recording image is also used, a prediction tap is constituted, and study processing or adaptation processing is performed, respectively.

[0243] A prediction coefficient when it judges that total of the absolute value of the pixel value (prediction error) of each pixel which constitutes an error image is below a predetermined threshold in step S167 on the other hand, A front are recording image

and a back are recording image (further) When the precision of the forecast of the foreground obtained from an error image if needed is high, it progresses to step S168. The error judging section 50 MUX51 is controlled, and the front are recording image memorized by the foreground are recording image storage section 44 and a back are recording image, the prediction coefficient memorized by the prediction coefficient storage section 46, and when the error image is memorized by the error image storage section 49, the error image is made to read and multiplex further. And MUX51 outputs the multiplexing data obtained as a result of the multiplexing to a multiplexer 17 (drawing 2) as a coding result of the foreground of the 1st frame thru/or each Nth frame, and ends foreground coding processing.

[0244] In addition, it may be made to make the new error image obtained whenever processing of step S166 is performed memorize in the form which overwrites the already memorized error image, and it leaves the already memorized error image to the error image storage section 49 as it is, and you may make it make it memorize it.

[0245] When making a new error image memorize in the form which overwrites the error image already memorized by the error image storage section 49, although a certain amount of limitation is always in improvement in the precision of the forecast of a foreground since the number of error images is one even if study of a prediction coefficient is performed repeatedly, they can lessen the amount of data of multiplexing data.

[0246] Although the amount of data of multiplexing data increases somewhat on the other hand since an error image becomes two or more sheets in leaving the error image already memorized by the error image storage section 49 in a new error image as it is and making it memorize Since the error image of two or more sheets is used for a front are recording image and a back are recording image, and a list, a prediction tap is constituted and study processing or adaptation processing is performed, respectively as shown in drawing 30 , the precision of the forecast of a foreground can be raised more. In addition, drawing 30 shows the case where there are two error images.

[0247] Moreover, although it asked for the prediction coefficient which calculates a forecast, also uses an error image when the prediction error is large, performs study processing again, and makes a prediction error small by performing adaptation processing using the prediction coefficient for which it asked by study processing in the above-mentioned case Irrespective of the size of a prediction error, it is also possible to make it output the prediction coefficient obtained as a result of study processing of the beginning by the study section 45 as a coding result of a foreground

with the front are recording image and back are recording image which were memorized by the foreground are recording image storage section 44. In this case, the foreground coding section 16 is that the adaptation processing section 47, the error count section 48, the error image storage section 49, and the error judging section 50 can be constituted without preparing.

[0248] Furthermore, in an above-mentioned case, a formula (9) defines the function g (F, B, E, n) which calculates the forecast of a foreground, and although it asked for the prediction coefficient of one set used common to this calculating the forecast of the foreground of the 1st frame thru/or all the Nth frame, in addition to this, a prediction coefficient can also be asked [every frame and] for every multiple frame.

[0249] Namely, what is necessary is to define Function g (F, B, E, n), as shown in an equation (10), to build a normal equation for every frame, and just to make it ask for a prediction coefficient by solution Lycium chinense, in asking for a prediction coefficient for every frame.

[0250]

g(F, B, E, n) =wF1nxf1+wF2nxf2+ ... + wB1nxb1+wB2nxb2+ ... +wE1nxe1+wE2nxe2+ ... ... (10)

Here, in a formula (10), the prediction coefficient used for wF1n, wF2n, ..., wB1n, wB2n, ..., wE1n, wE2n, and ... calculating the forecast of the foreground of the n-th frame is expressed.

[0251] Moreover, although the forecast of a foreground was calculated by linearity primary prediction, the forecast of a foreground can also be made to ask more than by the secondary high order prediction type in addition to this here.

[0252] Furthermore, although it was made to learn the prediction coefficient for calculating the forecast of the foreground of the 1st frame thru/or each Nth frame here using the front are recording image and back are recording image which consisted of foregrounds of the 1st frame thru/or each Nth frame, it is also possible for it to be made to perform study of a prediction coefficient using images other than a front are recording image and a back are recording image. That is, study of a prediction coefficient can be made to be carried out by operating the pixel value of the image which becomes with the noise so that the prediction error of the forecast of a foreground may be made small using the image of one or more sheets which becomes with a noise.

[0253] Next, drawing 31 shows the example of a configuration of the decoder 2 of drawing 1 .

[0254] The coded data transmitted through a transmission medium 3 (drawing 1) or

the coded data reproduced from the record medium 4 (drawing 1) is supplied to DMUX(demultiplexer) 81, and DMUX81 divides into a front are recording image, a back are recording image, a prediction coefficient, a whole background, and a camera motion vector the coded data supplied there. In addition, when an error image is contained in coded data, DMUX81 also separates the error image from coded data.

[0255] Further, a front are recording image and a back are recording image, and when an error image is contained in coded data, the error image is supplied to the image storage section 86 from DMUX81. Moreover, a prediction coefficient, a whole background, or a camera motion vector is supplied to the prediction coefficient storage section 82, the background memory 87, and the camera motion vector storage section 88 from DMUX81, respectively.

[0256] The prediction coefficient storage section 82 memorizes the prediction coefficient from DMUX81. The adaptation processing section 83 calculates the forecast of the foreground of the 1st frame thru/or each Nth frame by the front are recording image memorized by the prediction coefficient memorized by the prediction coefficient storage section 82 and the list at the image storage section 86 and the back are recording image, and performing the same adaptation processing as a case [in / using an error image / corresponding to the need further / the adaptation processing section 47 of drawing 24].

[0257] The foreground storage section 84 memorizes the forecast of the foreground of the 1st frame thru/or each Nth frame called for by the adaptation processing section 83 as a decode result of the foreground of the 1st frame thru/or each Nth frame.

[0258] The synthetic section 85 is based on the camera motion vector vn of the n-th frame memorized by the camera motion vector storage section 88 from the whole background memorized by the background memory 87. The background of the n-th frame is started (extracting), and by compounding the decode result of the background of the n-th frame, and the foreground of the n-th frame memorized by the foreground storage section 84, the image of the n-th frame is decoded and it outputs.

[0259] The image storage section 86 memorizes an error image in the front are recording image supplied from DMUX81 and a back are recording image, and a list. The background memory 87 memorizes the whole background supplied from DMUX81. The camera motion vector storage section 88 memorizes the camera motion vector of the 1st frame supplied from DMUX81 thru/or each Nth frame.

[0260] Next, with reference to the flow chart of drawing 32 , the decode processing which decodes the image of the 1st frame thru/or the Nth frame as a series of images

performed in the decoder 2 of drawing 31 is explained.

[0261] First, in step S171, DMUX81 divides into a front are recording image, a back are recording image, a required error image, a prediction coefficient, a whole background, and a camera motion vector the coded data supplied there. A front are recording image, a back are recording image, and a required error image are supplied to the image storage section 86, and are memorized. Moreover, a prediction coefficient, a whole background, or a camera motion vector is supplied to the prediction coefficient storage section 82, the background memory 87, and the camera motion vector storage section 88, respectively, and is memorized.

[0262] Then, it progresses to step S172, and using the prediction coefficient memorized by the prediction coefficient storage section 82, the front are recording image memorized by the list at the image storage section 86, a back are recording image, and a required error image, the adaptation processing section 83 is performing the same adaptation processing as the case in the adaptation processing section 47 of drawing 24 , and calculates the forecast of the foreground of the 1st frame thru/or each Nth frame. This forecast is supplied to the foreground storage section 84, and is memorized as a decode result of the foreground of the 1st frame thru/or each Nth frame.

[0263] And it progresses to step S173, and in the synthetic section 85, based on the camera motion vector vn of the n-th frame memorized by the camera motion vector storage section 88, the background of the n-th frame is started from the whole background memorized by the background memory 87, and the decode result of the background of the n-th frame and the foreground of the n-th frame memorized by the foreground storage section 84 is compounded. In the synthetic section 85, the above processing is performed about the 1st frame thru/or all the Nth frame, and ends decode processing.

[0264] Next, hardware can also perform a series of processings mentioned above, and software can also perform. When software performs a series of processings, the program which constitutes the software is installed in the computer built into the encoder 1 and decoder 2 as hardware of dedication, or the general-purpose computer which performs various kinds of processings by installing various kinds of programs.

[0265] Then, the medium used in order to install in a computer the program which performs a series of processings mentioned above and to make it into the condition which can be performed by computer with reference to drawing 33 is explained.

[0266] As shown in drawing 33 (A), a user can be provided with a program in the condition of having installed in the hard disk 102 and semiconductor memory 103 as a

record medium which are built in the computer 101 beforehand.

[0267] Or as shown in drawing 33 (B), a program can be stored in record media, such as the floppy (trademark) disk 111, CD-ROM (Compact Disc Read Only Memory)112, the MO (Magneto optical) disk 113, DVD (Digital Versatile Disc)114, a magnetic disk 115, and semiconductor memory 116, temporarily or permanently, and can be offered as a software package again.

[0268] Furthermore, it transmits to a computer 101 on radio, or a program is transmitted to a computer 123 with a cable through the networks 131, such as LAN (Local Area Network) and the Internet, and can be made to store in the hard disk 102 to build in in a computer 101 through the satellite 122 for digital satellite broadcasting services from the download site 121, as shown in drawing 33 (C).

[0269] The medium in this description means the concept of the wide sense containing all these media.

[0270] Moreover, it is not necessary to necessarily process the step which describes the program offered by the medium to time series in accordance with the sequence indicated as a flow chart, and it is a juxtaposition thing also including the processing (for example, parallel processing or processing by the object) performed according to an individual in this description.

[0271] Next, drawing 34 shows the example of a configuration of the computer 101 of drawing 33 .

[0272] The computer 101 contains CPU (Central Processing Unit)142, as shown in drawing 34 . The input/output interface 145 is connected to CPU142 through the bus 141, and CPU142 will perform the program stored in ROM (Read Only Memory)143 corresponding to the semiconductor memory 103 of drawing 33 (A) according to it, if a command is inputted when the input section 147 which consists of a keyboard, a mouse, etc. is operated by the user through an input/output interface 145. Or it is transmitted from the program and satellite 122 with which CPU142 is stored in the hard disk 102 again, or a network 131, and the program which reading appearance was carried out from the program which was received in the communications department 148 and installed on the hard disk 102 or the floppy disk 111 with which the drive 149 was equipped, CD-ROM112, MO disk 113, DVD114, or the magnetic disk 115, and was installed on the hard disk 102 is loaded to RAM (Random Access Memory)144, and is performed. And CPU142 outputs the processing result to the display 146 which consists of LCD (Liquid CryStal Display) etc. through an input/output interface 145 if needed.

[0273]

[Effect of the Invention] According to the medium, a foreground is extracted from each screen of a series of images by the image coding equipment of this invention and the image coding approach, and the list, and they are asked for the prediction coefficient for predicting the foreground of each screen from the pixel which constitutes the image of one or more sheets. And a prediction coefficient and the image of one or more sheets are outputted as a coding result of the foreground of each screen. Therefore, it becomes possible to encode the foreground in a series of images efficiently.

[0274] According to the medium, the prediction coefficient for predicting the foreground of each screen of a series of images from the pixel which constitutes the image and the image of one or more sheets of one or more sheets from coded data is separated by the image decode equipment of this invention and the image decode approach, and the list, and they are asked for the forecast of the foreground of each screen from the image of one or more sheets and prediction coefficient. Therefore, it becomes possible to decode what encoded the foreground in a series of images efficiently.

[0275] According to the image processing system of this invention, a foreground is extracted from each screen of a series of images, and the prediction coefficient for predicting the foreground of each screen is called for from the pixel which constitutes the image of one or more sheets. And the prediction coefficient and the image of one or more sheets are outputted as coded data which it is as a result of [of the foreground of each screen] coding. On the other hand, the image and prediction coefficient of one or more sheets are separated from coded data, and the forecast of the foreground of each screen is calculated from the image of one or more sheets, and a prediction coefficient. Therefore, it becomes possible to encode the foreground in a series of images efficiently, and to decode the coding result.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the example of a configuration of the gestalt of 1 operation of the picture transmission equipment which applied this invention.

[Drawing 2] It is the block diagram showing the example of a configuration of the encoder 1 of drawing 1 .

[Drawing 3] It is drawing showing a series of images memorized by the are recording

section 11 of drawing 2 .

[Drawing 4] It is drawing for explaining processing of the camera motion detecting element 12 of drawing 2 .

[Drawing 5] It is the block diagram showing the example of a configuration of the camera motion detecting element 12 of drawing 2 .

[Drawing 6] It is drawing for explaining how asking for the camera motion vector by the camera motion detecting element 12 of drawing 5 .

[Drawing 7] It is a flow chart for explaining processing (camera motion detection processing) of the camera motion detecting element 12 of drawing 5 .

[Drawing 8] It is a flow chart for explaining the 1st example of the detail of the processing (center-of-gravity calculation processing of an attention frame) in step S3 of drawing 7 .

[Drawing 9] It is drawing showing a level table.

[Drawing 10] It is a flow chart for explaining the detail of the processing (center-of-gravity calculation processing of the motion detection range) in step S4 of drawing 7 .

[Drawing 11] It is a flow chart for explaining the 2nd example of the detail of the processing in step S3 of drawing 7 .

[Drawing 12] It is drawing showing a class table.

[Drawing 13] It is a flow chart for explaining the 3rd example of the detail of the processing in step S3 of drawing 7 .

[Drawing 14] It is drawing for explaining an edge pixel.

[Drawing 15] It is a flow chart for explaining the detail of processing (motion-less judgment processing) of the motion-less judgment section 25 of drawing 5 .

[Drawing 16] It is the block diagram showing the example of a configuration of the background extract section 14 of drawing 2 .

[Drawing 17] It is drawing for explaining processing of the drawing 16's existence range detecting element 31.

[Drawing 18] It is drawing for explaining processing of the read-out section 32 of drawing 16 .

[Drawing 19] It is drawing showing a frequency table.

[Drawing 20] It is a flow chart for explaining processing (background extract processing) of the background extract section 14 of drawing 16 .

[Drawing 21] It is a flow chart for explaining the detail of processing (background pixel extract processing) of step S124 of drawing 20 .

[Drawing 22] It is a flow chart for explaining the detail of processing (background

escape processing) of step S125 of drawing 20 .

[Drawing 23] It is drawing for explaining background escape processing of drawing 22 .

[Drawing 24] It is the block diagram showing the example of a configuration of the foreground coding section 16 of drawing 2 .

[Drawing 25] It is drawing for explaining processing of the foreground are recording image configuration section 43 of drawing 24 .

[Drawing 26] It is the block diagram showing the example of a configuration of the study section 45 of drawing 24 .

[Drawing 27] It is the block diagram showing the example of a configuration of the adaptation processing section 47 of drawing 24 .

[Drawing 28] It is a flow chart for explaining the detail of processing (foreground coding processing) of the foreground coding section 16 of drawing 24 .

[Drawing 29] A prediction tap is drawing showing signs that it is constituted using an error image.

[Drawing 30] A prediction tap is drawing showing signs that it is constituted using the error image of two sheets.

[Drawing 31] It is the block diagram showing the example of a configuration of the decoder 2 of drawing 1 .

[Drawing 32] It is a flow chart for explaining processing (decode processing) of the decoder 2 of drawing 31 .

[Drawing 33] It is drawing for explaining the medium which applied this invention.

[Drawing 34] It is the block diagram showing the example of a configuration of the computer 101 of drawing 33 .

[Description of Notations]

1 Encoder 2 Decoder, 3 Transmission medium 4 A record medium, 11 are-recording section 12 A camera motion detecting element, 13 The camera motion vector storage section and 14 background extract section 15 Background memory, 16 Foreground coding section 17 MUX, 21 Center-of-gravity calculation section 22 A vector detecting element, 23 A write-in control section, 24 An are recording image memory, 25 Motion-less judgment section 31 An existence range detecting element, 32 Read-out section 33 Frequency count area 34 The frequency table storage section and 35 The write-in section 36 Background flag memory 41 The foreground extract section, 42 foreground storage section 43 The foreground are recording image configuration section, 44 foreground are recording image storage section, 45 The study section, 46 Prediction coefficient storage section 47 The adaptation processing section, 48 Error count section 49 The error image storage section, 50 Error judging

section 51 MUX, 61 prediction tap configuration section 62 The normal equation configuration section, 63 The prediction coefficient calculation section, 71 The prediction tap configuration section, 72 Prediction operation part 81 DMUX, 82 Prediction coefficient storage section 83 The adaptation processing section, 84 Foreground storage section 85 The synthetic section, 86 image storage section 87 Background memory 88 The camera motion vector storage section, 101 Computer 102 Hard disk 103 Semiconductor memory, 111 Floppy disk 112 CD-ROM, 113 An MO disk, 114 DVD, 115 Magnetic disk 116 Semiconductor memory, 121 download site 122 satellites, 131 Network 141 buses 142 CPU 143 ROM 144 RAM 145 Input/output interface 146 Display 147 Input section 148 Communications department 149 Drive

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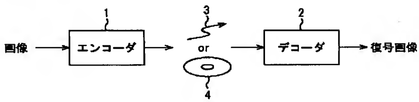
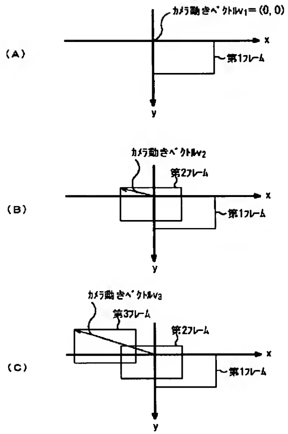
DRAWINGS

[Drawing 1]



画像伝送装置

[Drawing 4]



[Drawing 9]

画素値のレベル	度数f_k	$\Sigma x_k, \Sigma y_k$
レベルK		
⋮	⋮	⋮
レベル3		
レベル2		
レベル1		

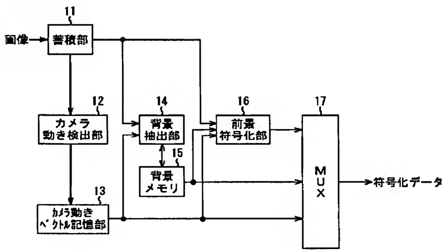
レベルテーブル

[Drawing 12]

輝度	度数f_k	$\Sigma x_k, \Sigma y_k$
クラスK		
⋮	⋮	⋮
クラス3		
クラス2		
クラス1		

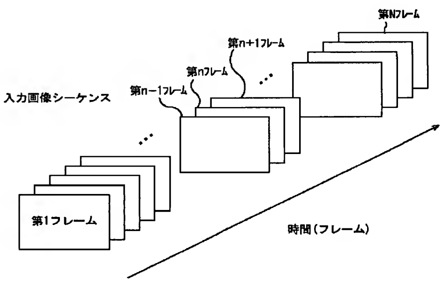
クラステーブル

[Drawing 2]

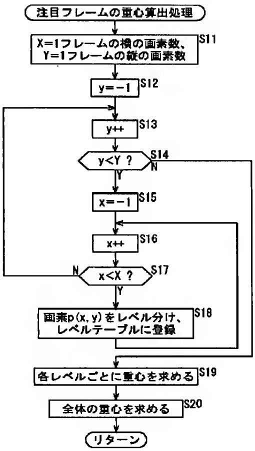


エンコーダ 1

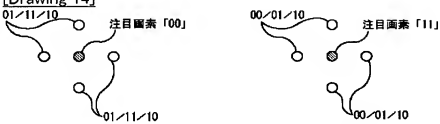
[Drawing 3]



[Drawing 8]

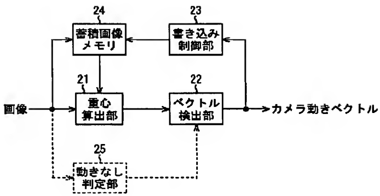


[Drawing 14]



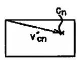
（A）注目画素が「00」の場合　　（B）注目画素が「11」の場合

[Drawing 5]

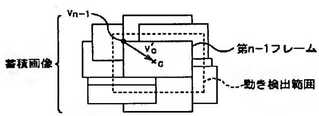


カメラ動き検出部 12

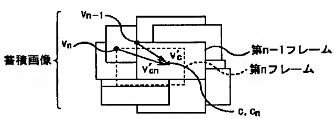
[Drawing 6]



（A） 注目フレーム（第nフレーム）の重心cn

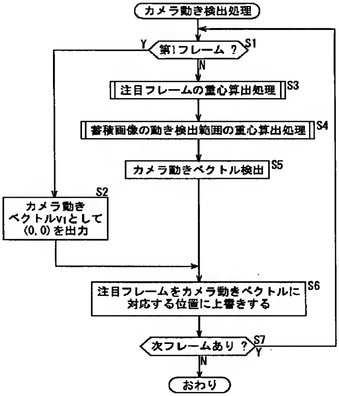


（B） 動き検出範囲の重心c

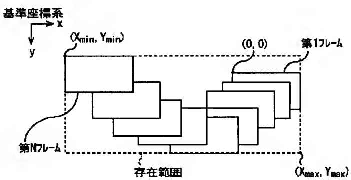


（C） 注目フレーム（第nフレーム）の
カメラ動きベクトルv_n（$=v_{n-1}+v'_c-v'_{cn}$）

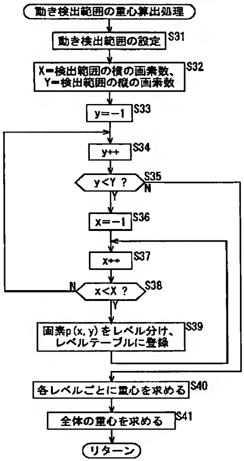
[Drawing 7]



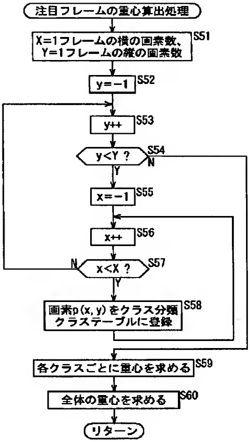
[Drawing 17]



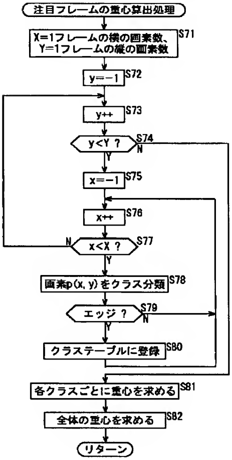
[Drawing 10]


動き検出範囲の重心算出処理
動き検出範囲の設定
S31
X=検出範囲の横の画素数、
Y=検出範囲の縦の画素数
S32
y=−1
S33
y++
S34
y<Y ?
S35
N
Y
x=−1
S36
x++
S37
x<X ?
S38
N
Y
画素p(x, y)をレベル分け、
レベルテーブルに登録
S39
各レベルごとに重心を求める
S40
全体の重心を求める
S41
リターン

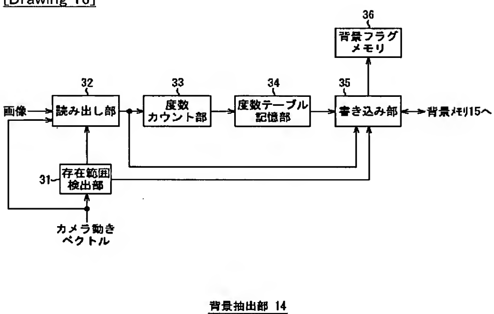
[Drawing 11]


注目フレームの重心算出処理
X=1フレームの横の画素数、
Y=1フレームの縦の画素数
S51
y=−1
S52
y++
S53
y<Y ?
S54
N
Y
x=−1
S55
x++
S56
x<X ?
S57
N
Y
画素p(x, y)をクラス分類
クラステーブルに登録
S58
各クラスごとに重心を求める
S59
全体の重心を求める
S60
リターン

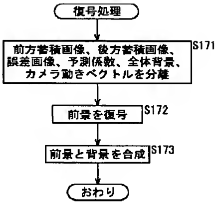
[Drawing 13]



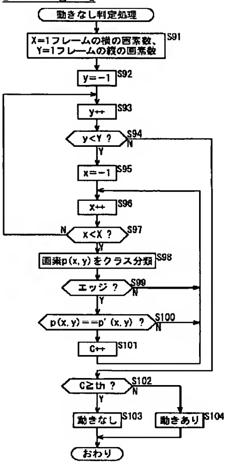
[Drawing 16]



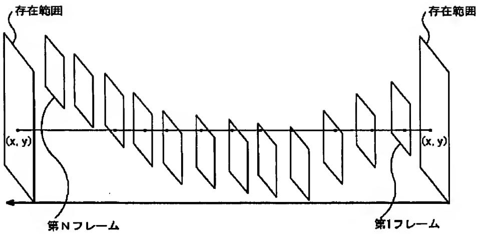
[Drawing 32]



[Drawing 15]



[Drawing 18]

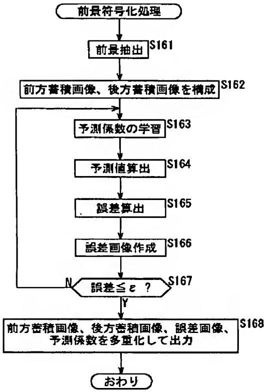


[Drawing 19]

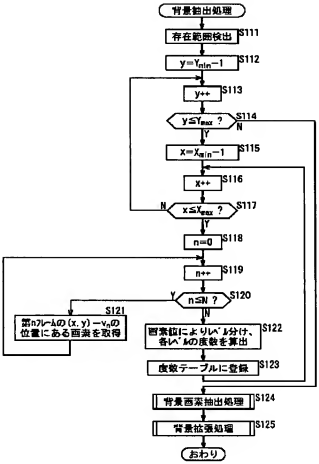
座標	第1度数ﾚﾍﾞﾙ	割合	第2度数ﾚﾍﾞﾙ	割合	…	第M度数ﾚﾍﾞﾙ	割合
X_{min}, Y_{min}					…		
…					…		
0, 0					…		
0, 1					…		
…					…		
X_{max}, Y_{max}					…		

度数テーブル

[Drawing 28]

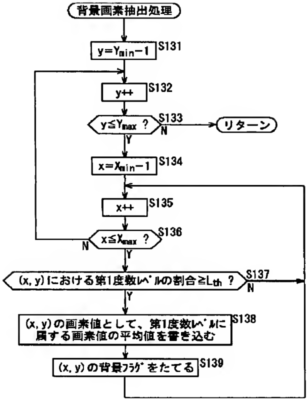

前景符号化処理
前景抽出
S161
前方蓄積画像、後方蓄積画像を構成
S162
予測係数の学習
S163
予測値算出
S164
誤差算出
S165
誤差画像作成
S166
誤差≦ε ?
S167
N
Y
前方蓄積画像、後方蓄積画像、誤差画像、
予測係数を多重化して出力
S168
おわり

[Drawing 20]

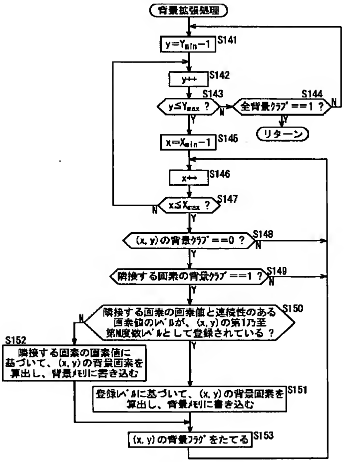


背景抽出処理
存在範囲検出
S111
y=Ymin−1
S112
y++
S113
y≦Ymax ?
S114
N
Y
x=Xmin−1
S115
x++
S116
x≦Xmax ?
S117
N
Y
n=0
S118
n++
S119
n≦N ?
S120
Y
N
第nフレームの(x, y)−vnの位置にある画素を取得
S121
画素値によりレベル分け、各レベルの度数を算出
S122
度数テーブルに登録
S123
背景画素抽出処理
S124
背景拡張処理
S125
おわり

[Drawing 21]

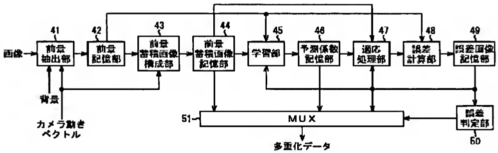

背景画素抽出処理
y=Ymin−1
S131
y++
S132
y≦Ymax ?
S133
N
リターン
Y
x=Xmin−1
S134
x++
S135
x≦Xmax ?
S136
N
Y
(x, y)における第1度数レベルの割合≧Lth ?
S137
N
Y
(x, y)の画素値として、第1度数レベルに属する画素値の平均値を書き込む
S138
(x, y)の背景フラグをたてる
S139

[Drawing 22]


背景拡張処理
y=Ymin−1
S141
y++
S142
S143
y≦Ymax ?
N
Y
S144
全背景ｸﾗﾌﾞ==1 ?
N
Y
リターン
x=Xmin−1
S145
x++
S146
x≦Xmax ?
S147
N
Y
(x, y)の背景ｸﾗﾌﾞ==0 ?
S148
N
Y
隣接する画素の背景ｸﾗﾌﾞ==1 ?
S149
N
Y
隣接する画素の画素値と連続性のある
画素値のﾚﾍﾞﾙが、(x, y)の第1乃至
第N度数ﾚﾍﾞﾙとして登録されている ?
S150
N
Y
S152
隣接する画素の画素値に
基づいて、(x, y)の背景画素を
算出し、背景ﾒﾓﾘに書き込む
登録ﾚﾍﾞﾙに基づいて、(x, y)の背景画素を
算出し、背景ﾒﾓﾘに書き込む
S151
(x, y)の背景ﾌﾗｸﾞをたてる
S153

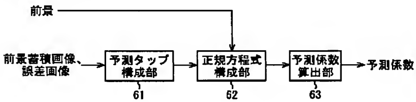
[Drawing 23]

[Drawing 24]



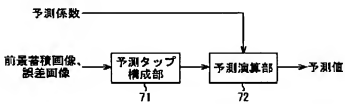
前景符号化部 16

[Drawing 26]



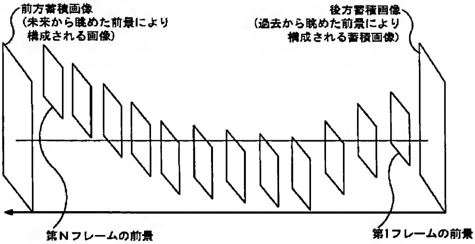
学習部 45

[Drawing 27]

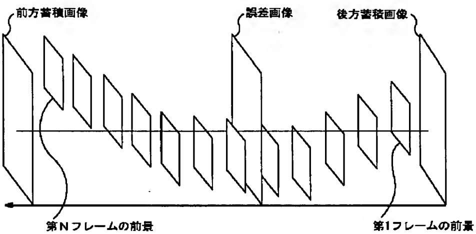


適応処理部 47

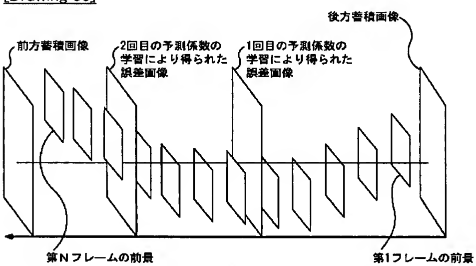
[Drawing 25]



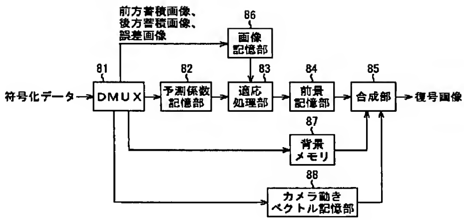
[Drawing 29]



[Drawing 30]

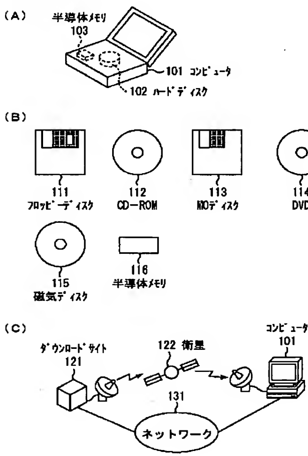


[Drawing 31]

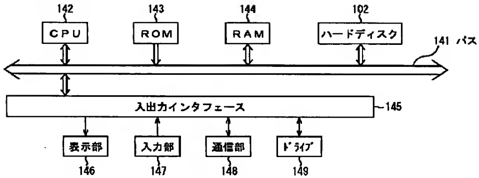


デコーダ 2

[Drawing 33]



[Drawing 34]



コンピュータ 101